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RESEARCH
CONSULTING

Socioeconomic Cost Modeling For Washington State Oil Spill Scenarios

SUMMARY REPORT

PRELIMINARY DRAFT III

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SOCIOECONOMIC COST MODELING
FOR WASHINGTON STATE OIL SPILL SCENARIOS
EXECUTIVE SUMMARY

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Overview of Oil Spill Socioeconomic Costs

An oil spill can have serious socioeconomic impacts on the affected region, local communities, residents, the state, and the federal government. These impacts include damages to real and personal property, loss of use of natural resources (parks and recreation areas), and loss of income and expenses (fishing, tourism, recreation, shipping and other commerce). As a major shipping port and tourist and recreation area, Puget Sound and the Columbia River are particularly vulnerable to socioeconomic impacts from oil spills. Reduction in tourism, commercial fishing, and blocking the shipping port could have widespread impacts. There can also be serious impacts on the Tribal Nations, particularly with respect to subsistence fishing.

In the case of an oil spill, the Oil Pollution Act of 1990 allows the federal government to collect from responsible parties socioeconomic costs including:

- Loss of natural resources (lost-use);
- Losses for destruction of real/personal property;
- Losses of subsistence use of natural resources;
- Net loss of taxes/fees/net profit due to injury, destruction/loss of real/personal property or natural resources;
- Loss of profits or earning capacity due to damage to real/personal property or natural resources (*e.g.*, fish); and
- Governmental costs for providing increased or additional public services during or after removal activities.

In addition to the costs that the federal and state government authorities can collect, there are also possible third-party damage suits that can ensue. Successful damage suits in past oil spill incidents have included payments for

- Out-of-pocket costs relating to removal of oil or restoration of impacted property;
- Economic losses, including lost revenues and profits due to lost tourism or business opportunities;
- Cost of repair/replacement of physical property damaged by a spill (*e.g.*, fishing nets, docks);
- Loss of revenues from decreased fishing resource;
- Increased cost of fishing due to necessity of fishing in different locations;
- Damages to real property, including potential damage to market values of properties "stigmatized" by an oil spill;
- Possible replacement of natural resources irretrievably oiled by the creation of new natural resources;
- Losses by sport fishermen incurred as result of curtailment of fishing; and
- Subsistence losses to American Natives.

The socioeconomic costs are based on the real and perceived impacts, which are related to the degree of oiling, the oil type and persistence, the degree to which cleanup operations can mitigate the oil impacts, and the time of the impact.

Note that all costs presented in this report are in 2004 dollars.

Washington Oil Spill Scenarios Modeled

The trajectory, oil removal, and shoreline impact results from SIMAP modeling of the oil spill scenarios shown in Table 1 were used to estimate socioeconomic costs. Each "scenario" consists of a specific amount and type of oil spilled in a specific *location* (single site or along a shipping lane), coupled with a response strategy. Different response strategies were applied to the same type of spill (oil type and amount) in the same location.

Table 1: WASHINGTON OIL SPILL SCENARIOS

Scenario No.[1]	Location	Spill Type[2,3]	Modeled Response							
			No[4]	Mechanical[5]			Mechanical + Dispersant[6]			Mechanical + ISB[7]
				Fed	State	3rd	Fed	State	3rd	State
OUTER COAST										
OC-Crud-N	Duntz Rock NW of Cape Flattery	65,000 bbl ANS crude	●							
OC-Crud-R-Fed	Duntz Rock NW of Cape Flattery	65,000 bbl ANS crude		●						
OC-Crud-R-ST	Duntz Rock NW of Cape Flattery	65,000 bbl ANS crude			●					
OC-Crud-R-3	Duntz Rock NW of Cape Flattery	65,000 bbl ANS crude				●				
OC-Crud-C-Fed	Duntz Rock NW of Cape Flattery	65,000 bbl ANS crude					●			
OC-Crud-C-ST	Duntz Rock NW of Cape Flattery	65,000 bbl ANS crude						●		
OC-Crud-C-3	Duntz Rock NW of Cape Flattery	65,000 bbl ANS crude							●	
OC-Crud-R-ISB	Duntz Rock NW of Cape Flattery	65,000 bbl ANS crude								●
STRAIT OF JUAN DE FUCA (NEAH BAY TO DUNGENESS SPIT)										
S1-Bunk-N	Neah Bay /Dungeness Spit	25,000 bbl Bunker C	●							
S1-Bunk-R-Fed	Neah Bay /Dungeness Spit	25,000 bbl Bunker C		●						
S1-Bunk-R-ST	Neah Bay /Dungeness Spit	25,000 bbl Bunker C			●					
S1-Bunk-R-3	Neah Bay /Dungeness Spit	25,000 bbl Bunker C				●				
S1-Bunk-R-ISB	Neah Bay /Dungeness Spit	25,000 bbl Bunker C								●
S1-Dies-N	Neah Bay /Dungeness Spit	65,000 bbl Diesel	●							
S1-Dies-R-Fed	Neah Bay /Dungeness Spit	65,000 bbl Diesel		●						
S1-Dies-R-ST	Neah Bay /Dungeness Spit	65,000 bbl Diesel			●					
S1-Dies-R-3	Neah Bay /Dungeness Spit	65,000 bbl Diesel				●				

Table 1: WASHINGTON OIL SPILL SCENARIOS *(continued)*											
Scenario No.[1]	**Location**	**Spill Type[2,3]**	**Modeled Response**								
			No[4]	**Mechanical[5]**			**Mechanical + Dispersant[6]**			**Mechanical + ISB[7]**	
				Fed	**State**	**3rd**	**Fed**	**State**	**3rd**	**State**	
STRAIT OF JUAN DE FUCA (NEAH BAY TO PORT ANGELES)											
S2-Crud-N	Neah Bay/Port Angeles	65,000 bbl ANS crude	●								
S2-Crud-R-Fed	Neah Bay/Port Angeles	65,000 bbl ANS crude		●							
S2-Crud-R-ST	Neah Bay/Port Angeles	65,000 bbl ANS crude			●						
S2-Crud-R-3	Neah Bay/Port Angeles	65,000 bbl ANS crude				●					
S2-Crud-C-Fed	Neah Bay/Port Angeles	65,000 bbl ANS crude					●				
S2-Crud-C-ST	Neah Bay/Port Angeles	65,000 bbl ANS crude						●			
S2-Crud-C-3	Neah Bay/Port Angeles	65,000 bbl ANS crude							●		
S2-Crud-R-ISB	Neah Bay/Port Angeles	65,000 bbl ANS crude								●	
SAN JUAN ISLANDS											
SI-Crud-N	Rosario/Georgia Strait S Lopez Island to Cherry Pt.	65,000 bbl ANS crude	●								
SI-Crud-R-Fed	Rosario/Georgia Strait S Lopez Island to Cherry Pt.	65,000 bbl ANS crude		●							
SI-Crud-R-ST	Rosario/Georgia Strait S Lopez Island to Cherry Pt.	65,000 bbl ANS crude			●						
SI-Crud-R-3	Rosario/Georgia Strait S Lopez Island to Cherry Pt.	65,000 bbl ANS crude				●					
SI-Crud-C-Fed	Rosario Strait/S Lopez Island to Pt. Lawrence	65,000 bbl ANS crude					●				
SI-Crud-C-ST	Rosario Strait/S Lopez Island to Pt. Lawrence	65,000 bbl ANS crude						●			
SI-Crud-C-3	Rosario Strait/S Lopez Island to Pt. Lawrence	65,000 bbl ANS crude							●		
IS-Crud-N	Port Angeles to south end of Lopez Island	65,000 bbl ANS crude	●								
IS-Crud-R-Fed	Port Angeles to south end of Lopez Island	65,000 bbl ANS crude		●							
IS-Crud-R-ST	Port Angeles to south end of Lopez Island	65,000 bbl ANS crude			●						
IS-Crud-R-3	Port Angeles to south end of Lopez Island	65,000 bbl ANS crude				●					
IS-Crud-C-Fed	Port Angeles to south end of Lopez Island	65,000 bbl ANS crude					●				
IS-Crud-C-ST	Port Angeles to south end of Lopez Island	65,000 bbl ANS crude						●			
IS-Crud-C-3	Port Angeles to south end of Lopez Island	65,000 bbl ANS crude							●		

Table 1: WASHINGTON OIL SPILL SCENARIOS *(continued)*											
Scenario No.[1]	**Location**	**Spill Type[2,3]**	**Modeled Response**								
			No4	**Mechanical[5]**			**Mechanical + Dispersant[6]**			**Mechanical + ISB[7] State**	
				Fed	**State**	**3rd**	**Fed**	**State**	**3rd**		
INNER STRAITS (PUGET SOUND)											
IS-Crud-N	Port Angeles to south end of Lopez Island	65,000 bbl ANS crude	●								
IS-Crud-R-Fed	Port Angeles to south end of Lopez Island	65,000 bbl ANS crude		●							
IS-Crud-R-ST	Port Angeles to south end of Lopez Island	65,000 bbl ANS crude			●						
IS-Crud-R-3	Port Angeles to south end of Lopez Island	65,000 bbl ANS crude				●					
IS-Crud-C-Fed	Port Angeles to south end of Lopez Island	65,000 bbl ANS crude					●				
IS-Crud-C-ST	Port Angeles to south end of Lopez Island	65,000 bbl ANS crude						●			
IS-Crud-C-3	Port Angeles to south end of Lopez Island	65,000 bbl ANS crude							●		
COLUMBIA RIVER (WEST)											
C1-Bunk-N	3 miles off entrance to Columbia River to Astoria	25,000 bbl Bunker C	●								
C1-Bunk-R-Fed	3 miles off entrance to Columbia River to Astoria	25,000 bbl Bunker C		●							
C1-Bunk-R-ST	3 miles off entrance to Columbia River to Astoria	25,000 bbl Bunker C			●						
C1-Bunk-R-3	3 miles off entrance to Columbia River to Astoria	25,000 bbl Bunker C				●					
COLUMBIA RIVER (EAST)											
C1-Bunk-N	Portland to Longview	25,000 bbl Bunker C	●								
C1-Bunk-R-Fed	Portland to Longview	25,000 bbl Bunker C		●							
C1-Bunk-R-ST	Portland to Longview	25,000 bbl Bunker C			●						
C1-Bunk-R-3	Portland to Longview	25,000 bbl Bunker C				●					

[1] Scenario numbers based on: location (OC = outer coast; S1, S2 = Strait of Juan de Fuca; SI = San Juan Islands; IS = Inner Straits; C1, C2 = Columbia River);oil type (crud = crude; dies = diesel; bunk = Bunker C); response type (R = "removal" for mechanical recovery only or *in-situ* burning; C = chemical dispersant application); and response level (N = no response; Fed = federal response capabilities; ST = state response capabilities; and 3 = hypothetical 3rd alternative response capabilities). [2] bbl = barrels (equivalent to 42 gallons). [3] ANS crude = Alaska North Slope crude. [4] "No response" means no *on-water* recovery or dispersion attempted. Protective booming, shoreline cleanup, salvage, and spill management/monitoring conducted as required. [5] On-water mechanical response conducted using federal, state, or hypothetical 3rd alternative response capabilities. Protective booming, shoreline cleanup, salvage, disposal, and spill management/monitoring conducted as required. [6]Dispersant applications conducted where permitted by state guidelines with concurrent mechanical response using federal, state, or hypothetical 3rd alternative response capabilities. Protective booming, shoreline cleanup, salvage, disposal, and spill management/monitoring conducted as required. [7]ISB = *in situ* burning conducted according to state guidelines with concurrent mechanical response using *state* response capabilities. Protective booming, shoreline cleanup, salvage, disposal, and spill management/monitoring conducted as required.

Response Strategies

The response strategies applied in the modeled scenarios are shown in Table 2.

TABLE 2: RESPONSE STRATEGY COMPONENTS FOR MODELED RESPONSE TYPES

Response Type	On-Water Mechanical Containment/ Recovery[1]	Dispersant Application[2]	In-Situ Burning[3]	Protective Boom[4]	Salvage (Source Control)[5]	Spill Mgt.[6]	Monitor[7]	Shoreline Cleanup[8]	Disposal[9]
No Response[10]				●	●	●	●	●	●
Mechanical	●			●	●	●	●	●	●
Mechanical + Dispersant	●	●		●	●	●	●	●	●
Mechanical + ISB[11]	●		●	●	●	●	●	●	●

[1] On-water containment and recovery operations, including booms, skimmers, vacuum trucks, boats, oil herding, oil containment, and helicopter/small plane overflights to direct responders, according to either federal, state, or hypothetical 3rd alternative response capabilities, as shown in Table Z. [2] Dispersants applied in locations permitted by state guidelines. [3] *In-situ* burning conducted in locations permitted by state guidelines. [4] Protective booming applied in locations specified in Geographic Response Plans. [5] Salvage includes only source control – *i.e.*, those measures required to stop the leak in the vessel, remove remaining oil, and to steady or right the vessel sufficiently to reduce dangers to response workers and the public. This salvage does not include any repairs to the vessel to bring it back into operation or to reduce owner losses. [6] Spill management includes responsible party Qualified Individual services and management of response personnel and resources. [7] Monitoring includes the services of all governmental (state, federal, local) officials required to supervise response operations, including federal and state on-scene coordinators, as well overflights required to monitor response effectiveness and slick movement, communications, and unified command operations. [8] Shoreline cleanup includes all removal of oil from shoreline substrates by manual and mechanical methods, including the use of sorbents.

Response Capability

For all response strategies employing on-water mechanical containment and recovery (*i.e.*, all responses except "no response"), the mechanical response capability was specified by one of three levels of response capability (also referred to as "CAPS"):

- ***Federal:*** US Coast Guard Vessel and Facility Response Plans for Oil: 2003 Removal Equipment Requirements and Alternative Technology Revisions: Notice of Proposed Rulemaking. *Federal Register* Vol. 67 (198): pp. 63,331 – 63,452. 11 October 2002)
- ***State:*** current state guidance (proposed planning standards in WAC 173-181)
- ***3rd alternative:*** hypothetical higher response capability alternative as determined by Contingency Plan Rule Advisory Committee

The actual required response capability for each level consists of specifications for amounts of and timing of arrival for booming equipment, oil removal equipment (skimmers, vacuum trucks, oil recovery vessels), and oil storage equipment, depending on the location and amount of oil spilled. The response capability levels applied in this modeling study are shown in Tables 3 – 9. *(See also Figures* Note that for all response capability levels, the equipment amounts are *cumulative*.) Spill responses are described in greater detail in *Response Cost Modeling for Washington State Oil Spill Scenarios,* a companion volume to this report.

TABLE 3: Mechanical Spill Response Capabilities: Outer Coast Spill 65,000 bbl ANS Crude												
	FEDERAL (Offshore)				STATE				3RD ALTERNATIVE			
Hr	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*
2	-	-	-	-	yes	-	-	-	yes	3,500	-	-
4	-	-	-	-	-	-	-	-		20,000	12,000	12,000
6	-	-	-	-	-	3,500	-	-	-	-	-	-
12	-	-	-	-	-	-	-	-	-	-	-	-
15	-	-	-	-	-	40,000	36,000	36,000	-	40,000	36,000	72,000
24	-	30,000	12,500	25,000	-	40,000+	48,000	96,000	-	40,000	48,000	144,000
48	-	30,000	25,000	50,000	-	40,000+	60,000	180,000	-	40,000	60,000	180,000
72	-	30,000	50,000	100,000	-	40,000	72,000	180,000+	-	-	-	-

TABLE 4: Mechanical Spill Response Capabilities: Strait of Juan de Fuca Spill 25,000 bbl Bunker C												
	FEDERAL (Nearshore)				STATE				3RD ALTERNATIVE			
Hr	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*
2	-	-	-	-	-	1,392	-	-	-	1,392	-	-
4	-	-	-	-	-	-	-	-	-	20,000	3,087	3,087
6	-	-	-	-	-	10,000	1,234.8	1,234.8	-	-	-	-
12	-	30,000	6,483	12,966		40,000	3,087	4,630.5	-	30,000	9,261	18,722
24	-	-	-	-	-	40,000+	7,408.8	14,817.6	-	40,000+	12,348	37,044
36	-	30,000	10,805	21,160	-	-	-	-	-	-	-	-
48	-	-	-	-	-	40,000+	10,495.8	31,487.4	-	40,000+	15,435	46,305
60	-	30,000	17,287	34,574	-	-	-	-	-	-	-	-
72	-	-	-	-	-	40,000+	12,348	31,487.4+	-	-	-	-

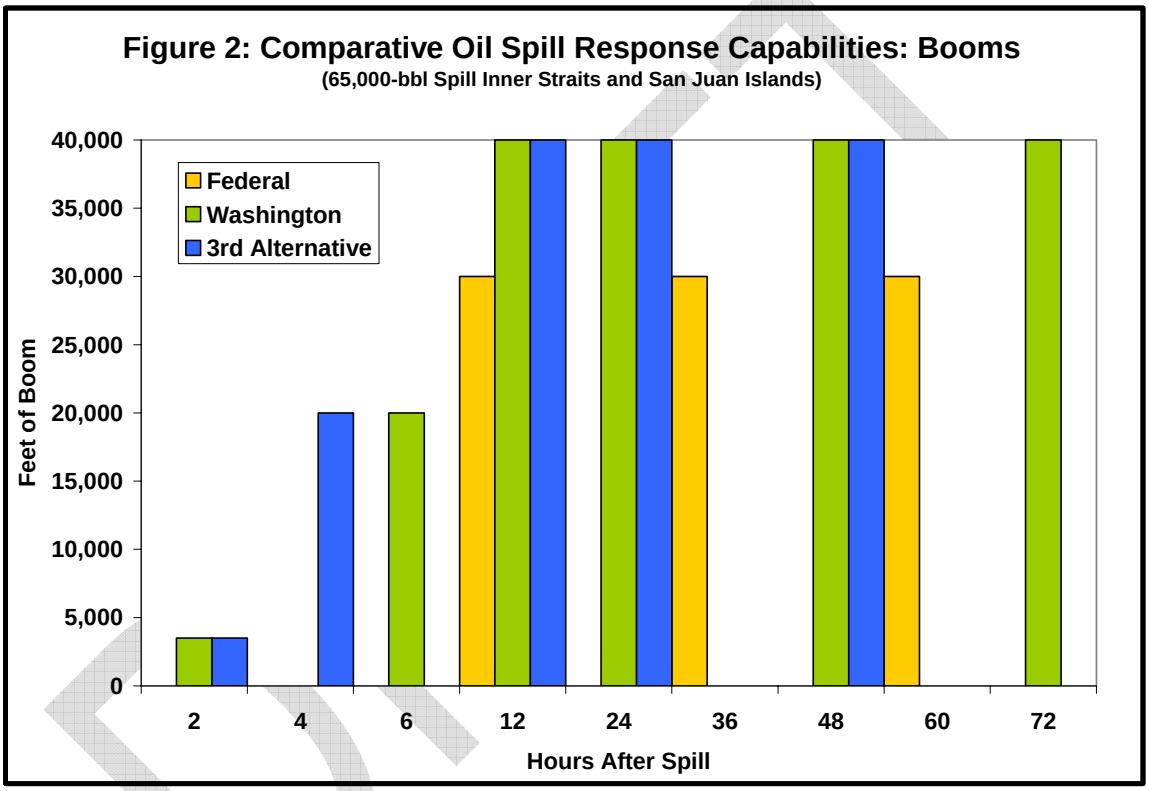
TABLE 5: Mechanical Spill Response Capabilities: Strait of Juan de Fuca Spill 65,000 bbl Diesel												
	FEDERAL (Nearshore)				STATE				3RD ALTERNATIVE			
Hr	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*
2	-	-	-	-	-	3,500	-	-	-	3,500	-	-
4	-	-	-	-	-	-	-	-	-	20,000	36,000	36,000
6	-	-	-	-	-	10,000	12,000	12,000	-	-	-	-
12	-	30,000	12,500	25,000	-	40,000	36,000	54,000	-	40,000	48,000	96,000
24	-	-	-	-	-	40,000	48,000	96,000	-	40,000	60,000	180,000
36	-	30,000	25,000	50,000	-	-	-	-	-	-	-	-
48	-	-	-	-	-	40,000	60,000	180,000	-	40,000	72,000	216,000
60	-	30,000	50,000	100,000	-	-	-	-	-	-	-	-
72	-	-	-	-	-	40,000+	72,000	180,000+	-	-	-	-

TABLE 6: Mechanical Spill Response Capabilities: Strait of Juan de Fuca Spill 65,000 bbl Crude												
Hr	FEDERAL (Nearshore)				STATE				3RD ALTERNATIVE			
	Over-flight	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*
2	-	-	-	-	-	3,500	-	-	-	3,500	-	-
4	-	-	-	-	-	-	-	-	-	20,000	36,000	36,000
6	-	-	-	-	-	10,000	12,000	12,000	-	-	-	-
12	-	30,000	12,500	25,000		40,000	36,000	54,000	-	40,000	48,000	96,000
24	-	-	-	-	-	40,000	48,000	96,000	-	40,000	60,000	180,000
36	-	30,000	25,000	50,000	-	-	-	-	-	-	-	-
48	-	-	-	-	-	40,000	60,000	180,000	-	40,000	72,000	216,000
60	-	30,000	50,000	100,000	-	-	-	-	-	-	-	-
72	-	-	-	-	-	40,000+	72,000	180,000+	-	-	-	-

TABLE 7: Mechanical Spill Response Capabilities: San Juan Islands Spill 65,000 bbl ANS Crude												
Hr	FEDERAL (Nearshore)				STATE				3RD ALTERNATIVE			
	Over-flight	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*
2	-	-	-	-	-	3,500	-	-	-	3,500	-	-
4	-	-	-	-	-	-	-	-	-	20,000	36,000	36,000
6	-	-	-	-	-	20,000	12,000	12,000	-	-	-	-
12	-	30,000	12,500	25,000	-	40,000	36,000	54,000	-	40,000	48,000	56,000
24	-	-	-	-	-	40,000+	48,000	96,000	-	40,000	60,000	180,000
36	-	30,000	25,000	50,000	-	-	-	-	-	-	-	-
48	-	-	-	-	-	40,000	60,000	120,000	-	40,000	72,000	216,000
60	-	30,000	50,000	100,000	-	-	-	-	-	-	-	-
72	-	-	-	-	-	40,000+	72,000	120,000+	-	-	-	-

TABLE 8: Mechanical Spill Response Capabilities: Inner Straits Spill 65,000 bbl ANS Crude												
Hr	FEDERAL (Nearshore)				STATE				3RD ALTERNATIVE			
	Over-flight	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*
2	-	-	-	-	-	3,500	-	-	-	3,500	-	-
4	-	-	-	-	-	-	-	-	-	20,000	36,000	36,000
6	-	-	-	-	-	20,000	12,000	12,000	-	-	-	-
12	-	30,000	12,500	25,000		40,000	36,000	54,000	-	40,000	48,000	56,000
24	-	-	-	-	-	40,000+	48,000	96,000	-	40,000	60,000	180,000
36	-	30,000	25,000	50,000	-	-	-	-	-	-	-	-
48	-	-	-	-	-	40,000	60,000	120,000	-	40,000	72,000	216,000
60	-	30,000	50,000	100,000	-	-	-	-	-	-	-	-
72	-	-	-	-	-	40,000+	72,000	120,000+	-	-	-	-

TABLE 9: Mechanical Spill Response Capabilities: Columbia River Spill 25,000 bbl Bunker C												
Hr	FEDERAL (River)				STATE				3RD ALTERNATIVE			
	Over-flight	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*	*Over-flight*	*Boom (ft)*	*Recovery (bpd)*	*Storage (bpd)*
2	-	-	-	-	-	1,392	-	-	-	1,392	-	-
4	-	-	-	-	-	-	-	-	-	20,000	3,087	3,087
6	-	-	-	-	-	10,000	1,234.8	1,234.8	-	-	-	-
12	-	-	-	-	-	40,000	3,087	-	-	30,000	9,261	18,522
24	-	30,000	5,186	10,372	-	40,000+	7,408.8	14,817.6	-	40,000+	12,348	37,044
36	-	-	-	-	-	-	-	-	-	-	-	-
48	-	30,000	6,915	13,830	-	40,000+	10,495.8	20,991.6	-	40,000	15,345	46,305
60	-	30,000	10,372	20,744	-	40,000+	12,348	20,990+	-	-	-	-
72	-	-	-	-	-	-	-	-	-	-	-	-



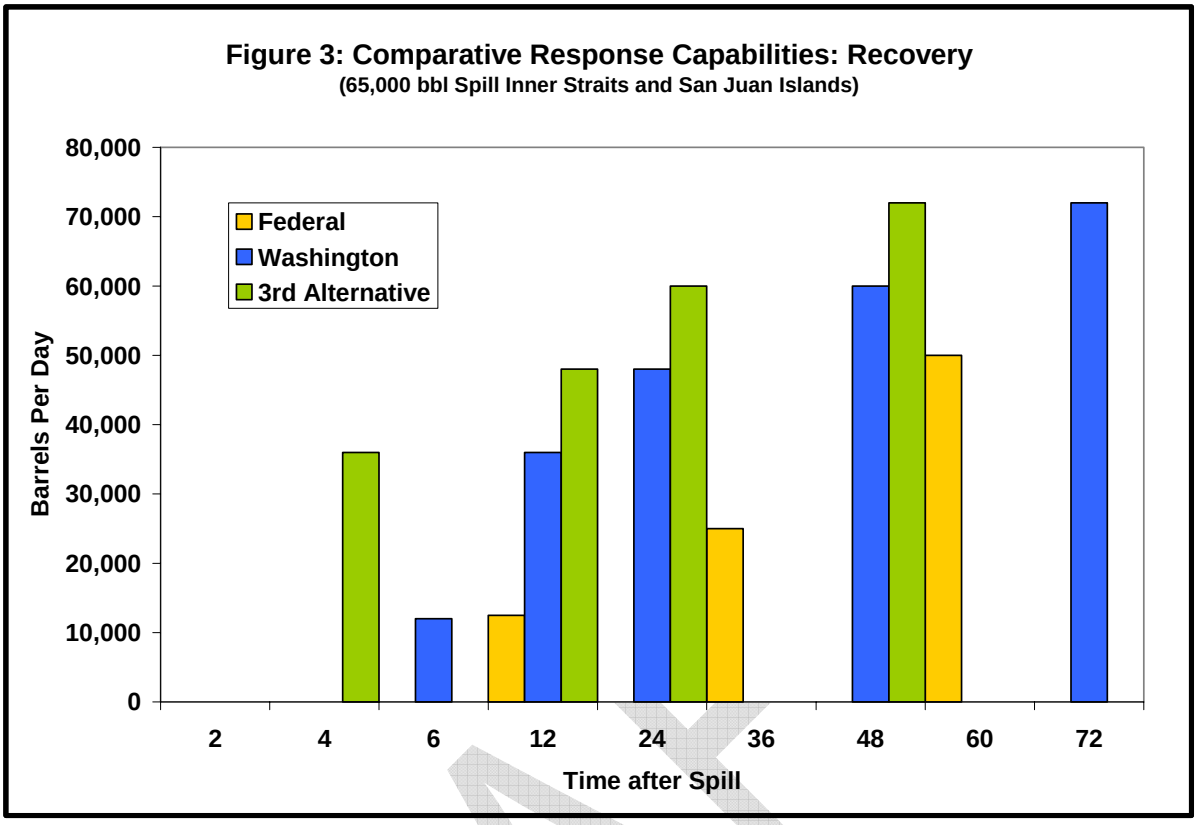


Figure 3: Comparative Response Capabilities: Recovery
(65,000 bbl Spill Inner Straits and San Juan Islands)
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Barrels Per Day
Federal
Washington
3rd Alternative
2
4
6
12
24
36
48
60
72
Time after Spill

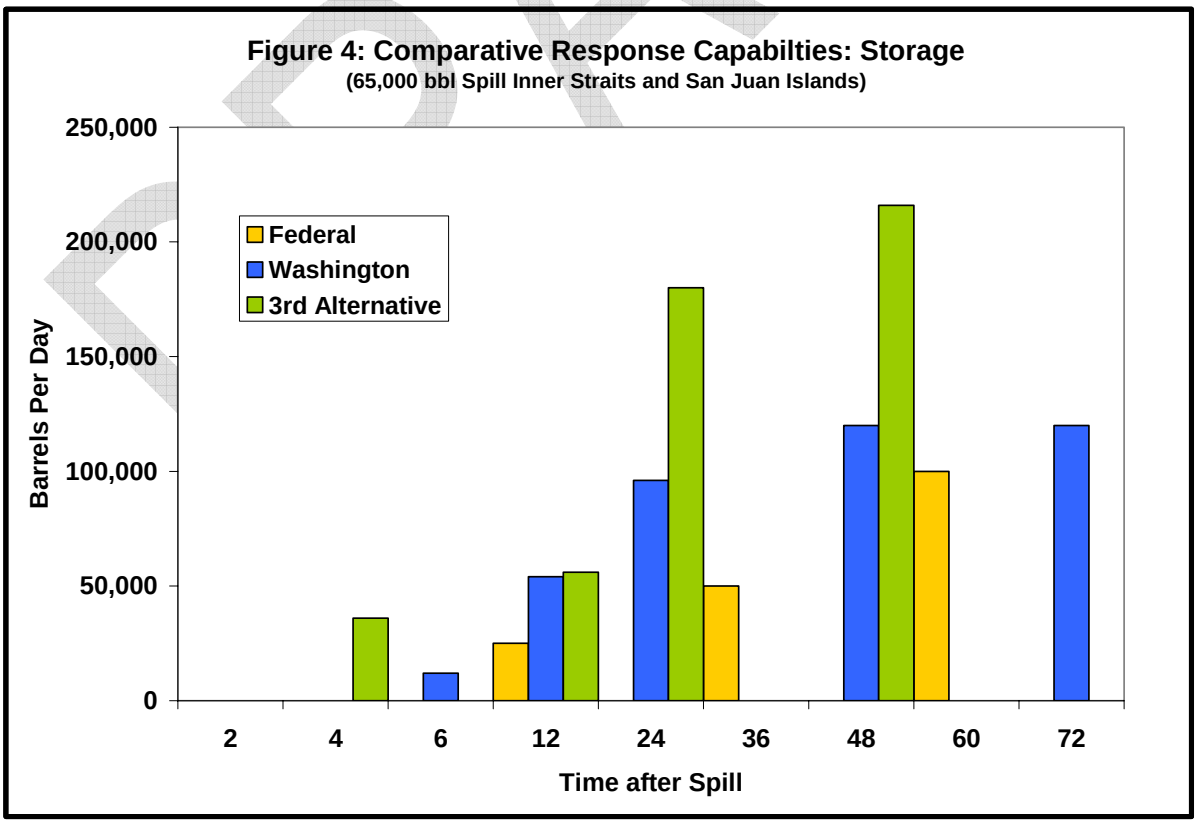


Figure 4: Comparative Response Capabilties: Storage
(65,000 bbl Spill Inner Straits and San Juan Islands)
250,000
200,000
150,000
100,000
50,000
0
Barrels Per Day
Federal
Washington
3rd Alternative
2
4
6
12
24
36
48
60
72
Time after Spill

Socioeconomic Resources at Risk

Socioeconomic resources potentially at risk for oil spill impacts that were considered in this study include:

- **Ports**
  - Disruption of port business by response operations and presence of oil slicks in vessel traffic lanes and port areas and bans or reduction in traffic.
    - Costs for vessel operating delays in-port and at-sea.
    - Delays in port business (interest on delayed port business income).
    - Lost wages for port employees.
  - Impacts on marinas
    - Damage to boats (oiling)
    - Lost income due to marina not being usable
- **Commercial Shellfishing**
  - Loss of income from shellfishing
  - Loss of shellfish (wholesale costs)
- **Commercial Fishing**
  - Loss of income from shellfishing
  - Loss of shellfish (wholesale costs)
  - Damage to fishing equipment and boats
- **Tribal Nations**
  - Impacts on Tribal lands
  - Fishing income losses
  - Subsistence Fishing
    - Loss of subsistence food
    - Impact on vulnerable populations (e.g., children, Tribal Nations)
- **Parks and Recreation**
  - National parks
    - Lost income from national parks
    - Lost use of national parks
  - State parks
    - Lost income from state parks
    - Lost use of state parks
  - Recreational boating
    - Lost income from state parks
    - Lost use of state parks
  - Sportfishing
    - Lost income from sportfishing
    - Loss of sporting fish
    - Lost use of sportfishing
  - Wildlife viewing and nature study
    - Lost income
    - Lost use
    - Wildlife hunting
- **Tourism**
  - Lost direct income from tourism
  - Lost indirect income from tourism

Impacts on Ports

The impact that modeled Washington oil spills and response operations would have on port areas in Washington, British Columbia, and Oregon (shown in Figures 5 and 6), were examined. Port areas were assumed to be impacted when floating oil was 10 g/m^2 or higher.

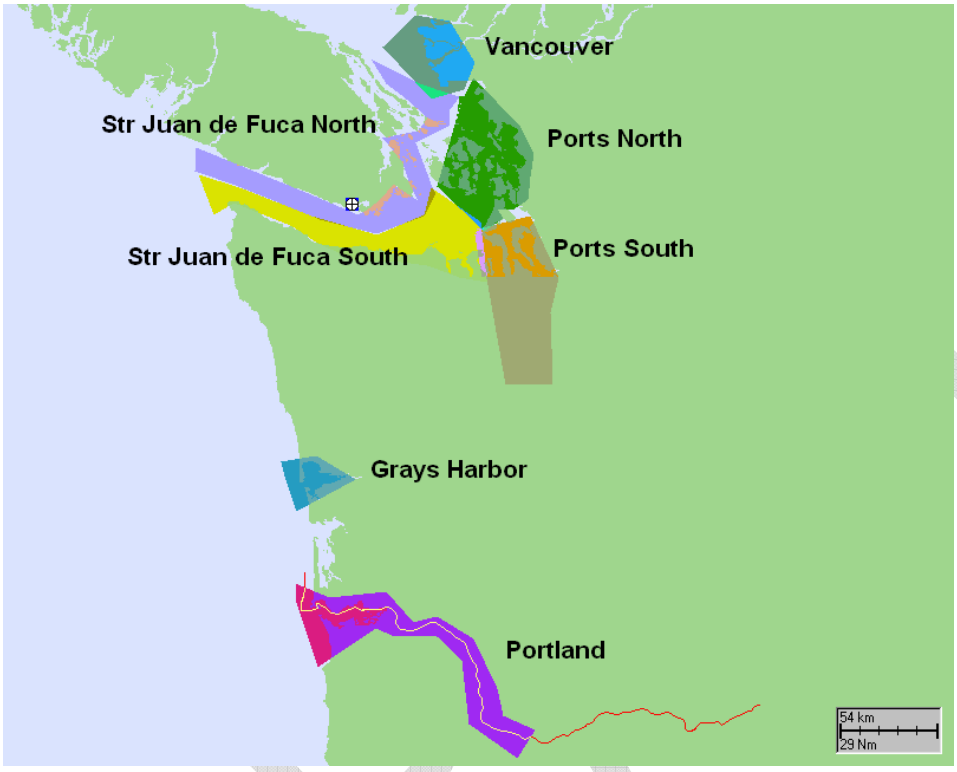


Figure 5: Port areas used in modeling of Washington spill scenarios

Disruption of port business by response operations and presence of oil slicks in vessel traffic lanes and port areas and bans or reduction in traffic was considered from the perspective of vessel operating costs, delays in port business, and lost wages for port employees (labor).

Costs for Operating Delayed Vessels In-Port and At-Sea

The typical annual vessel traffic for the Puget Sound and Columbia River were determined (as shown in Tables 10 and 11.) Vessel operation costs for vessels idling at sea (unable to enter the port area) and operation costs for vessels delayed in the port (unable to leave) were based on US Army Corps of Engineers (2000*a*,*b*) costs for operation of vessels. It was assumed that 50% of the vessels would be at sea (or entering the port areas) and 50% would be in the ports (or attempting to leave the port areas) at any one time. The annual vessel traffic was assumed to be distributed evenly across the year to determine daily port visits. The distribution of vessel types on any one day was assumed to be the same as across the entire year. The costs for operating at-sea and in-port were averaged and multiplied by daily vessel visits per port (Tables 15 and 16).

Ports were assumed to be blocked only to the extent that the oil covered the port area (and port entry areas in the straits) and for the estimated duration of on-water response operations, during which time vessel traffic would be curbed. The blockage of the Columbia River entry to Portland was assumed to be six days for the bunker spills with the percentage of blockage assumed to be five times the area actually covered by the oil. This would allow for response operations (boom towing, etc.) to be conducted while vessels were diverted or blocked entry. It also accounts for the narrower approach to the port with less space to divert vessels.

In Puget Sound, the blockage was assumed to be six days for crude and bunker spills (with the crude oil dissipating more rapidly than the bunker fuel, but also containing 65,000 bbl of oil rather than 25,000 bbl as for the bunker fuel spills). The diesel spills were assumed to cause two days of blockage due to the higher rate of dissipation and evaporation of this oil type. In all cases, the blockage area was assumed to be three times the actual area of oil covered, again to allow for response operations and for the diversion of a larger number of vessels.

Blockages to the Strait of Juan de Fuca were assumed to affect all Puget Sound ports. Blockages to inner areas of the sound were assumed to impact vessel traffic going both in and out of the inner ports.

Delays in Port Business

Delays in port business were assumed to be directly related to the vessel blockage. The costs were estimated based on annual reported vessel-related business in the ports (based on information from the port websites and personal communications with the port operators). Business was assumed to be delayed rather than completely voided. In other words, the business would still be conducted, but at a delayed time. The delay cost was based on 7% annual interest (0.019% daily interest for each day of delay). (See Tables 12 -15, and Table 17)

Lost wages for port employees (paid hourly wages) were based on the number of days of blocked port business (again based on vessel blockage and oiled areas) and the daily wages for each port (Tables 13, 15, and 18).

At the same time, delays in port business were assumed to *save* the port operators the majority of their operating costs during the time period of the port blockage, again to the extent that the ports were blocked. The costs to labor and the costs to the port operators represent different types of costs and need to be counterbalanced in cost-benefit analyses (Table 19).

Table 10: Vessel and Oil Movements Through Columbia River (to Portland, Oregon) (1999)								
Vessel Type	**Vessel Size**	**Transits Per Year**	**Daily # Vessels**	**Daily Cost Sea/Vessel**	**Daily Cost at Sea**	**Daily Cost in Port/Vessel**	**Daily Cost in Port**	**Average Daily Cost (Port +Sea/2)**
Crude tankers (laden)	<75,000 DWT	12	0.03	$21,000	$690	$18,000	$592	**$641**
	75,000-110,000 DWT	12	0.03	$27,000	$888	$23,000	$756	**$822**
	>110,000 DWT	0	0.00	$30,000	$0	$25,000	$0	**$0**
Crude tankers (ballast)	avg. 67,000 DWT	24	0.07	$25,000	$1,644	$20,000	$1,315	**$1,479**
Product tankers (laden)	avg. 22,000 DWT	38	0.10	$17,000	$1,770	$14,000	$1,458	**$1,614**
	avg. 55,000 DWT	54	0.15	$20,000	$2,959	$17,000	$2,515	**$2,737**
Product tankers (ballast)	avg. 22,000 DWT	38	0.10	$17,000	$1,770	$14,000	$1,458	**$1,614**
	avg. 55,000 DWT	54	0.15	$20,000	$2,959	$17,000	$2,515	**$2,737**
Product barges (laden)	avg. 6,000 DWT	38	0.10	$15,000	$1,562	$10,000	$1,041	**$1,301**
	avg. 12,000 DWT	54	0.15	$16,000	$2,367	$11,000	$1,627	**$1,997**
Bulk carriers	<50,000 DWT	70	0.19	$15,000	$2,877	$12,000	$2,301	**$2,589**
	50,000-100,000 DWT	700	1.92	$17,000	$32,603	$13,000	$24,932	**$28,767**
	>100,000 DWT	0	0.00	$20,000	$0	$14,000	$0	**$0**
Bulk liquid carriers		36	0.10	$17,000	$1,677	$14,000	$1,381	**$1,529**
Containerships	<2,500 TEU	54	0.15	$19,000	$2,811	$15,000	$2,219	**$2,515**
	2,500-4,000 TEU	32	0.09	$29,000	$2,542	$21,000	$1,841	**$2,192**
	>4,000 TEU	442	1.21	$50,000	$60,548	$30,000	$36,329	**$48,438**
Vehicle carriers		184	0.50	$15,000	$7,562	$11,000	$5,545	**$6,553**
Factory fishing vessels	300-3,000 GRT	0	0.00	$5,000	$0	$3,000	$0	**$0**
	>3,000 GRT	0	0.00	$11,000	$0	$6,000	$0	**$0**
Fishing boats	>300 GRT	0	0.00	$2,000	$0	$1,000	$0	**$0**
Passenger vessels	300-3000 GRT	8	0.02	$3,000	$66	$2,000	$44	**$55**
	>3,000 GRT	0	0.00	$5,000	$0	$3,000	$0	**$0**
TOTALS				**$416,000**	**$127,293**	**$314,000**	**$87,868**	**$107,581**
Adapted from US Army Corps of Engineers Waterborne Transport 1999.								

Table 11: Vessel and Oil Movements Through Puget Sound (2000)								
Vessel Type	**Vessel Size**	**Transits Per Year**	**Daily # Vessels**	**Daily Cost Sea/Vessel**	**Daily Cost at Sea**	**Daily Cost in Port/Vessel**	**Daily Cost in Port**	**Average Daily Cost (Port +Sea/2)**
Crude tankers (laden)	<75,000 DWT	79	0.22	$21,000	$4,545	$18,000	$3,896	$4,221
	75,000-110,000 DWT	81	0.22	$27,000	$5,992	$23,000	$5,104	$5,548
	>110,000 DWT	138	0.38	$30,000	$11,342	$25,000	$9,452	$10,397
Crude tankers (ballast)	avg. 67,000 DWT	6	0.02	$25,000	$411	$20,000	$329	$370
Product tankers (laden)	avg. 22,000 DWT	12	0.03	$17,000	$559	$14,000	$460	$510
	avg. 55,000 DWT	23	0.06	$20,000	$1,260	$17,000	$1,071	$1,166
Product tankers (ballast)	avg. 22,000 DWT	20	0.05	$17,000	$932	$14,000	$767	$849
	avg. 55,000 DWT	179	0.49	$20,000	$9,808	$17,000	$8,337	$9,073
Product barges (laden)	avg. 6,000 DWT	5	0.01	$15,000	$205	$10,000	$137	$171
	avg. 12,000 DWT	18	0.05	$16,000	$789	$11,000	$542	$666
Bulk carriers	<50,000 DWT	1,913	5.24	$15,000	$78,616	$12,000	$62,893	$70,755
	50,000-100,000 DWT	501	1.37	$17,000	$23,334	$13,000	$17,844	$20,589
	>100,000 DWT	122	0.33	$20,000	$6,685	$14,000	$4,679	$5,682
Bulk liquid carriers		186	0.51	$17,000	$8,663	$14,000	$7,134	$7,899
Containerships	<2,500 TEU	435	1.19	$19,000	$22,644	$15,000	$17,877	$20,260
	2,500-4,000 TEU	510	1.40	$29,000	$40,521	$21,000	$29,342	$34,932
	>4,000 TEU	394	1.08	$50,000	$53,973	$30,000	$32,384	$43,178
Vehicle carriers		316	0.87	$15,000	$12,986	$11,000	$9,523	$11,255
Factory fishing vessels	300-3,000 GRT	59	0.16	$5,000	$808	$3,000	$485	$647
	>3,000 GRT	112	0.31	$11,000	$3,375	$6,000	$1,841	$2,608
Fishing boats	>300 GRT	167	0.46	$2,000	$915	$1,000	$458	$686
Passenger vessels	300-3000 GRT	16	0.04	$3,000	$132	$2,000	$88	$110
	>3,000 GRT	11	0.03	$5,000	$151	$3,000	$90	$121
TOTALS				**$416,000**	**$288,647**	**$314,000**	**$214,734**	**$251,690**
Adapted from Herbert Engineering, *et al*. 1999								

Table 12: Daily Impact of Port Disruption Due to Oil Spill and Response Operations				
Port	**Wages**	**Operating**	**Business**	**Delay Business[2]**
Anacortes	$1,849	N/A	$29,103	$5.53
Bellingham	$348	$25,690	$2,507	$0.48
Everett	$2,778	$35,928	$10,567	$2.01
Grays Harbor	$5,985	N/A	$161,605[1]	$30.70[1]
Olympia	$3,625	$3,625	$978,811	$18.60[3]
Port Angeles	$586	$16,389	$24,351	$4.63
Port Gamble	$82	N/A	$2,203[1]	$0.42[1]
Seattle	$179,517	$595,616	$4,328,767	$822.47
Tacoma	$211,713	$186,849	$1,290,411	$245.18
Vancouver	$1,026,733	N/A	$75,000,000	$14,250.00
Portland	$762,430	$523,836	$16,700,000	$3,173.00
Sources: Port budgets and port websites. [1]Extrapolated from daily wages and estimated size of port. [2]Based on daily interest rate of 0.019% (annual rate 7%).				

Table 13: Ports Disruption Due to Oil Spill and Response Operations By Port Area Impact				
Port	**Modeled Impacted Port Area(s)**		**Total Daily Impact[2]**	
	Incoming Traffic	**Outgoing Traffic**	**Labor**	**Port**
Anacortes	Str. Juan de Fuca South Ports North	Str. Juan de Fuca South Str. Juan de Fuca North[1] Ports North	**$1,849**	**($1,843)**
Bellingham	Str. Juan de Fuca South Ports North	Str. Juan de Fuca South Str. Juan de Fuca North[1] Ports North	**$348**	**($25,690)**
Everett	Str. Juan de Fuca South Ports North	Str. Juan de Fuca South Str. Juan de Fuca North[1] Ports North	**$2,778**	**($35,926)**
Grays Harbor	Grays Harbor	Grays Harbor	**$5,985[3]**	**($5,954)[3]**
Olympia	Str. Juan de Fuca South Ports South	Str. Juan de Fuca South Str. Juan de Fuca North[1] Ports South	**$3,625[3]**	**($3,606)[3]**
Port Angeles	Str. Juan de Fuca South	Str. Juan de Fuca North[1]	**$586**	**($16,384)**
Port Gamble	Str. Juan de Fuca South Ports South	Str. Juan de Fuca South Str. Juan de Fuca North[1] Ports South	**$82[3]**	**($82)[3]**
Seattle	Str. Juan de Fuca South Ports South	Str. Juan de Fuca South Str. Juan de Fuca North[1] Ports South	**$179,517**	**($594,794)**
Tacoma	Str. Juan de Fuca South Ports South	Str. Juan de Fuca South Str. Juan de Fuca North[1] Ports South	**$211,713**	**($186,604)**
Vancouver	Str. Juan de Fuca North[1] Vancouver	Str. Juan de Fuca North[1] Vancouver	**$1,026,733**	**($1,012,483)**
Portland	Portland	Portland	**$762,430**	**($520,663)**
Sources: Port budgets and port websites. [1]Includes Haro Strait as per map in Figure 6. [2]Assumes savings of operating expenses (including wages) and 0.019% daily interest on delayed business. Wages are loss to labor, but savings for port business. . [3]Extrapolated from daily wages and estimated size of port.				

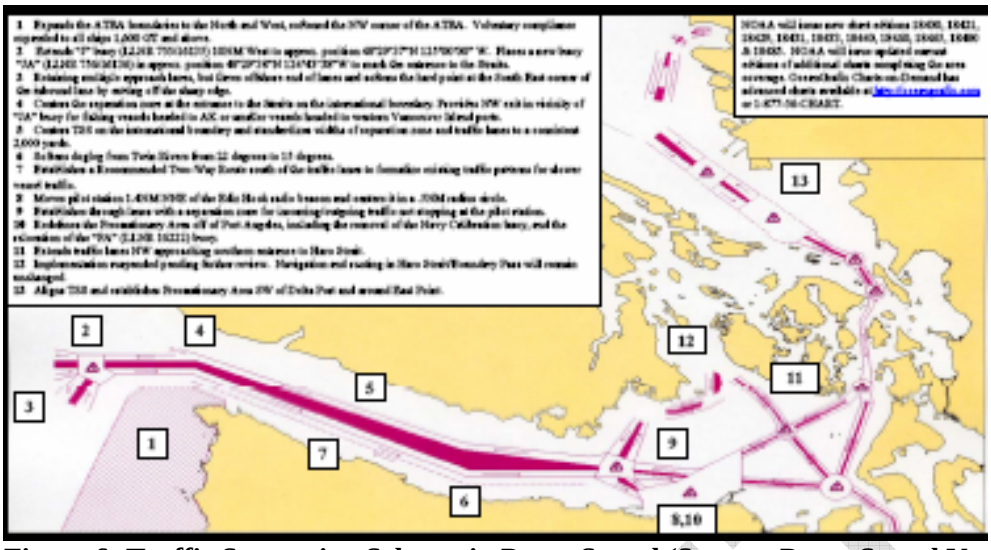


Figure 6: Traffic Separation Scheme in Puget Sound (Source: Puget Sound Vessel Traffic Service)

Table 14: Annual Export and Import Pass-Through for Washington's Ports					
EXPORTS ($ million)			**IMPORTS ($ million)**		
Commodity	**Annual Pass-Through**	**Interest Loss Per Day[1]**	**Commodity**	**Annual Pass-Through**	**Daily Interest Loss**
Aircraft	$26,257	$4.99	**High-Tech**	$10,428	$1.98
Forest Products	$2,769	$0.53	**Forest Products**	$4,536	$0.86
High Tech	$2,686	$0.51	**Motor Vehicles**	$3,740	$0.72
Data Processing Machines	$1,068	$0.20	**Aircraft Engines**	$2,816	$0.54
Aircraft Parts	$1,024	$0.20	**Motor Vehicle Parts**	$2,473	$0.47
Corn	$908	$0.18	**Petroleum Gas**	$2,421	$0.46
Wheat	$758	$0.14	**Aircraft Parts**	$2,123	$0.41
Seafood	$635	$0.12	**Arcade Game Parts**	$1,918	$0.36
Motor Vehicle Parts	$605	$0.11	**Data Processing Machines**	$1,855	$0.35
Typewriter/Office Parts	$454	$0.09	**Toys**	$1,229	$0.23
TOTAL	**$51,164**	**$9.72**	**TOTAL**	**$65,677**	**$12.47**
TOTAL DAILY BUSINESS INTEREST LOSS FOR DELAY IN BUSINESS = $22.19 million					

Source: Washington Public Ports Association (1999 data adjusted to 2003 $). [1]Based on daily interest rate of 0.019% (annual rate 7%) for delay in business.

Note: Grays Harbor/Aberdeen/Hoaquim Port has 85 annual vessel trips of smaller bulk carriers (0.23 trips per day). At a cost of $15,000 per vessel per day at sea and $12,000 per vessel per day in port, the average daily cost per day of port blockage is $3,105. This port was not impacted by any of the scenarios examined in this study.

Table 15: Oiling of Port Areas and Access in Oil Spill Scenarios							
Scenario	**Response**	**% Surface Area Covered by Floating Oil > 10g/m^2**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	4.04%	2.26%	1.87%	2.73%	5.04%	0.41%
	R-Fed	0.46%	0.34%	0.74%	0.51%	0.93%	0.10%
	R-ST	0.28%	0.30%	0.64%	0.41%	0.81%	0.00%
	R-3	0.20%	0.29%	0.52%	0.34%	0.67%	0.00%
	C-Fed	0.19%	0.30%	0.53%	0.34%	0.68%	0.00%
	C-ST	0.23%	0.33%	0.62%	0.40%	0.80%	0.00%
	C-3	0.19%	0.30%	0.53%	0.34%	0.68%	0.00%
IS-Crud	**N**	3.4%	2.7%	10.2%	5.4%	15.6%	0.0%
	R-Fed	1.0%	1.0%	1.3%	1.1%	3.1%	0.0%
	R-ST	0.8%	0.9%	0.8%	0.8%	2.1%	0.0%
	R-3	0.6%	0.8%	0.6%	0.7%	1.6%	0.0%
	C-Fed	1.0%	0.9%	1.1%	1.0%	2.7%	0.0%
	C-ST	0.6%	0.6%	0.2%	0.5%	1.0%	0.0%
	C-3	0.6%	1.1%	1.4%	1.0%	2.8%	0.0%
S1-Bunk	**N**	3.41%	4.52%	3.10%	3.67%	8.18%	0.75%
	R-Fed	1.29%	0.47%	1.40%	1.05%	2.42%	0.13%
	R-ST	1.29%	0.31%	2.15%	1.25%	3.21%	0.15%
	R-3	0.63%	0.42%	1.37%	0.81%	2.42%	0.00%
	R-ISB	1.28%	0.70%	0.59%	0.86%	2.07%	0.00%
S1-Dies	**N**	0.00%	0.16%	0.00%	0.05%	0.23%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
S2-Crud	**N**	4.69%	1.37%	2.16%	2.74%	6.55%	0.24%
	R-Fed	1.08%	0.50%	0.49%	0.69%	1.43%	0.29%
	R-ST	0.61%	0.28%	0.49%	0.46%	1.22%	0.00%
	R-3	0.34%	0.44%	0.46%	0.41%	1.21%	0.00%
	R-ISB	0.51%	0.23%	0.46%	0.40%	1.19%	0.00%
	C-Fed	4.84%	2.42%	2.25%	3.17%	6.26%	0.47%
	C-ST	0.34%	0.26%	0.46%	0.35%	1.16%	0.00%
	C-3	0.79%	0.46%	0.59%	0.61%	1.05%	0.25%
OC-Crud	**N**	0.3%	3.7%	3.1%	2.4%	6.2%	0.0%
	R-Fed	0.3%	1.5%	2.1%	1.3%	3.2%	0.0%
	R-ST	0.3%	1.5%	2.0%	1.3%	3.0%	0.0%
	R-3	0.2%	1.4%	1.9%	1.2%	2.9%	0.0%
	R-ISB	0.3%	1.5%	2.0%	1.3%	3.0%	0.0%
	C-Fed	0.3%	1.4%	2.0%	1.3%	3.1%	0.0%
	C-ST	0.3%	1.5%	2.0%	1.3%	3.1%	0.0%
	C-3	0.2%	1.3%	1.9%	1.2%	2.9%	0.0%
C1-Bunk[2]	**N**	0.00%	12.48%	15.61%	14.05%	18.48%	9.61%
	R-Fed	0.34%	4.96%	8.74%	4.68%	13.10%	0.00%
	R-ST	0.34%	3.41%	8.56%	4.10%	12.41%	0.00%
	R-3	0.34%	4.54%	7.85%	4.24%	11.77%	0.00%
C2-Bunk[2]	**N**	1.27%	0.73%	1.14%	1.05%	1.61%	0.48%
	R-Fed	0.92%	0.42%	0.69%	0.68%	1.18%	0.17%
	R-ST	0.16%	0.43%	0.93%	0.51%	1.30%	0.00%
	R-3	0.94%	0.40%	0.85%	0.73%	1.31%	0.15%
[1]Puget Sound and Straits ports only. [2]Columbia River ports only. Grays Harbor not impacted.							

Table 16: Cost Impact of Oiling of Port Areas and Access in Oil Spill Scenarios							
Scenario	**Response**	**Vessel Delay Operating Costs**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$183,395	$102,673	$84,916	$123,661	$123,661	$18,687
	R-Fed	$20,991	$15,415	$33,668	$23,358	$23,358	$4,650
	R-ST	$12,849	$13,407	$28,962	$18,406	$18,406	$114
	R-3	$9,111	$13,058	$23,666	$15,278	$15,278	$224
	C-Fed	$8,685	$13,446	$23,945	$15,359	$15,359	$0
	C-ST	$10,569	$15,059	$28,148	$17,925	$17,925	$0
	C-3	$8,685	$13,446	$23,945	$15,359	$15,359	$0
IS-Crud	**N**	$154,224	$122,472	$462,672	$244,944	$244,944	$0
	R-Fed	$45,360	$45,360	$58,968	$49,896	$49,896	$0
	R-ST	$36,288	$40,824	$36,288	$36,288	$36,288	$0
	R-3	$27,216	$36,288	$27,216	$31,752	$31,752	$0
	C-Fed	$45,360	$40,824	$49,896	$45,360	$45,360	$0
	C-ST	$27,216	$27,216	$9,072	$22,680	$22,680	$0
	C-3	$27,216	$49,896	$63,504	$45,360	$45,360	$0
S1-Bunk	**N**	$154,470	$204,910	$140,709	$166,696	$166,696	$34,048
	R-Fed	$58,729	$21,184	$63,431	$47,781	$47,781	$6,109
	R-ST	$58,541	$13,906	$97,519	$56,656	$56,656	$6,977
	R-3	$28,577	$19,254	$62,008	$36,613	$36,613	$0
	R-ISB	$58,281	$31,675	$26,985	$38,980	$38,980	$0
S1-Dies	**N**	$23	$2,362	$8	$798	$798	$0
	R-Fed	$3	$7	$8	$6	$6	$0
	R-ST	$11	$8	$8	$9	$9	$1
	R-3	$2	$4	$9	$5	$5	$0
S2-Crud	**N**	$212,738	$62,194	$97,767	$124,283	$124,283	$10,689
	R-Fed	$48,989	$22,671	$22,058	$31,166	$31,166	$12,937
	R-ST	$27,670	$12,697	$22,016	$20,743	$20,743	$0
	R-3	$15,422	$19,868	$20,944	$18,792	$18,792	$0
	R-ISB	$23,134	$10,314	$20,854	$18,067	$18,067	$0
	C-Fed	$219,542	$109,635	$102,246	$143,803	$143,803	$21,398
	C-ST	$15,422	$11,608	$20,697	$15,970	$15,970	$0
	C-3	$35,834	$20,856	$26,543	$27,788	$27,788	$11,293
OC-Crud	**N**	$13,563	$167,936	$141,797	$107,765	$107,765	$0
	R-Fed	$12,730	$70,271	$93,779	$58,927	$58,927	$0
	R-ST	$13,286	$68,241	$90,431	$57,319	$57,319	$0
	R-3	$11,064	$61,568	$86,443	$53,025	$53,025	$0
	R-ISB	$14,859	$68,818	$88,812	$57,497	$57,497	$0
	C-Fed	$12,082	$65,587	$92,565	$56,744	$56,744	$0
	C-ST	$12,313	$68,394	$89,821	$56,843	$56,843	$0
	C-3	$10,971	$60,101	$87,396	$52,823	$52,823	$0
C1-Bunk	**N**	$0	$402,783	$503,802	$453,454	$596,429	$310,156
	R-Fed	$10,973	$160,081	$282,077	$151,044	$422,793	$0
	R-ST	$10,973	$110,055	$276,268	$132,325	$400,524	$0
	R-3	$10,973	$146,525	$253,353	$136,843	$379,869	$0
C2-Bunk	**N**	$40,988	$23,560	$36,793	$33,888	$51,962	$15,492
	R-Fed	$29,692	$13,555	$22,269	$21,947	$38,084	$5,487
	R-ST	$5,164	$13,878	$30,015	$16,460	$41,957	$0
	R-3	$30,338	$12,910	$27,433	$23,560	$42,279	$4,841

[1]Vessel blockage of entry or departure from ports is assumed to be 6 days for the Columbia River for bunker spills with % block five times percentage of area covered (due to narrowness of river). Vessel blockage in Puget Sound is assumed to be 6 days for crude and bunker spills and 2 days for diesel spills with blockage % three times that of area covered by oil (due to high traffic).

Table 17: Cost Impact of Oiling of Port Areas and Access in Oil Spill Scenarios							
Scenario	**Response**	**Disruption of Port Business (Business Interest Due to Delay)**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$3,728	$2,086	$1,726	$2,519	$4,651	$378
	R-Fed	$424	$314	$683	$471	$858	$92
	R-ST	$258	$277	$591	$378	$747	$0
	R-3	$185	$268	$480	$314	$618	$0
	C-Fed	$175	$277	$489	$314	$628	$0
	C-ST	$212	$305	$572	$369	$738	$0
	C-3	$175	$277	$489	$314	$628	$0
IS-Crud	**N**	$3,138	$2,492	$9,413	$4,983	$14,396	$0
	R-Fed	$923	$923	$1,200	$1,015	$2,861	$0
	R-ST	$738	$831	$738	$738	$1,938	$0
	R-3	$554	$738	$554	$646	$1,476	$0
	C-Fed	$923	$831	$1,015	$923	$2,492	$0
	C-ST	$554	$554	$185	$461	$923	$0
	C-3	$554	$1,015	$1,292	$923	$2,584	$0
S1-Bunk	**N**	$3,147	$4,171	$2,861	$3,387	$7,549	$692
	R-Fed	$1,190	$434	$1,292	$969	$2,233	$120
	R-ST	$1,190	$286	$1,984	$1,154	$2,962	$138
	R-3	$581	$388	$1,264	$747	$2,233	$0
	R-ISB	$1,181	$646	$544	$794	$1,910	$0
S1-Dies	**N**	$0	$49	$0	$15	$71	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
S2-Crud	**N**	$4,328	$1,264	$1,993	$2,528	$6,044	$221
	R-Fed	$997	$461	$452	$637	$1,320	$268
	R-ST	$563	$258	$452	$424	$1,126	$0
	R-3	$314	$406	$424	$378	$1,117	$0
	R-ISB	$471	$212	$424	$369	$1,098	$0
	C-Fed	$4,466	$2,233	$2,076	$2,925	$5,777	$434
	C-ST	$314	$240	$424	$323	$1,070	$0
	C-3	$729	$424	$544	$563	$969	$231
OC-Crud	**N**	$277	$3,414	$2,888	$2,196	$5,768	$0
	R-Fed	$258	$1,430	$1,910	$1,200	$2,916	$0
	R-ST	$268	$1,384	$1,836	$1,163	$2,805	$0
	R-3	$221	$1,255	$1,763	$1,080	$2,667	$0
	R-ISB	$305	$1,403	$1,809	$1,172	$2,759	$0
	C-Fed	$249	$1,338	$1,883	$1,154	$2,842	$0
	C-ST	$249	$1,393	$1,827	$1,154	$2,824	$0
	C-3	$221	$1,218	$1,781	$1,070	$2,667	$0
C1-Bunk	**N**	$0	$2,376	$2,972	$2,675	$3,518	$1,830
	R-Fed	$65	$944	$1,664	$891	$2,494	$0
	R-ST	$65	$649	$1,630	$781	$2,363	$0
	R-3	$65	$864	$1,494	$807	$2,241	$0
C2-Bunk	**N**	$242	$139	$217	$200	$307	$91
	R-Fed	$175	$80	$131	$129	$225	$32
	R-ST	$30	$82	$177	$97	$247	$0
	R-3	$179	$76	$162	$139	$249	$29

Table 18: Cost Impact of Oiling of Port Areas and Access in Oil Spill Scenarios							
Scenario	**Response**	**Lost Wages Due to Port Business Disruption**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$1,189,428	$665,373	$550,552	$133,958	$247,307	$120,709
	R-Fed	$135,430	$100,100	$217,866	$25,025	$45,634	$29,441
	R-ST	$82,436	$88,324	$188,424	$20,118	$39,746	$0
	R-3	$58,883	$85,380	$153,095	$16,683	$32,876	$0
	C-Fed	$55,938	$88,324	$156,039	$16,683	$33,367	$0
	C-ST	$67,715	$97,156	$182,536	$19,628	$39,255	$0
	C-3	$55,938	$88,324	$156,039	$16,683	$33,367	$0
IS-Crud	**N**	$1,001,004	$794,915	$3,003,012	$264,972	$765,474	$0
	R-Fed	$294,413	$294,413	$382,737	$53,976	$152,113	$0
	R-ST	$235,530	$264,972	$235,530	$39,255	$103,045	$0
	R-3	$176,648	$235,530	$176,648	$34,348	$78,510	$0
	C-Fed	$294,413	$264,972	$323,854	$49,069	$132,486	$0
	C-ST	$176,648	$176,648	$58,883	$24,534	$49,069	$0
	C-3	$176,648	$323,854	$412,178	$49,069	$137,393	$0
S1-Bunk	**N**	$1,003,948	$1,330,747	$912,680	$180,083	$401,383	$220,810
	R-Fed	$379,793	$138,374	$412,178	$51,522	$118,747	$38,274
	R-ST	$379,793	$91,268	$632,988	$61,336	$157,511	$44,162
	R-3	$185,480	$123,653	$403,346	$39,746	$118,747	$0
	R-ISB	$376,849	$206,089	$173,704	$42,199	$101,572	$0
S1-Dies	**N**	$0	$15,702	$0	$2,453	$11,286	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
S2-Crud	**N**	$1,380,797	$403,346	$635,932	$134,449	$321,401	$70,659
	R-Fed	$317,966	$147,206	$144,262	$33,857	$70,168	$85,380
	R-ST	$179,592	$82,436	$144,262	$22,572	$59,864	$0
	R-3	$100,100	$129,542	$135,430	$20,118	$59,373	$0
	R-ISB	$150,151	$67,715	$135,430	$19,628	$58,392	$0
	C-Fed	$1,424,959	$712,479	$662,429	$155,548	$307,171	$138,374
	C-ST	$100,100	$76,547	$135,430	$17,174	$56,920	$0
	C-3	$232,586	$135,430	$173,704	$29,932	$51,522	$73,603
OC-Crud	**N**	$88,324	$1,089,328	$921,513	$116,784	$306,680	$0
	R-Fed	$82,436	$456,340	$609,435	$63,789	$155,058	$0
	R-ST	$85,380	$441,619	$585,882	$61,827	$149,169	$0
	R-3	$70,659	$400,402	$562,329	$57,411	$141,809	$0
	R-ISB	$97,156	$447,508	$577,049	$62,317	$146,716	$0
	C-Fed	$79,492	$426,899	$600,602	$61,336	$151,132	$0
	C-ST	$79,492	$444,564	$582,938	$61,336	$150,151	$0
	C-3	$70,659	$388,625	$568,217	$56,920	$141,809	$0
C1-Bunk	**N**	$0	$570,908	$714,092	$107,121	$140,897	$439,617
	R-Fed	$15,554	$226,899	$399,818	$35,682	$99,878	$0
	R-ST	$15,554	$155,993	$391,584	$31,260	$94,618	$0
	R-3	$15,554	$207,686	$359,105	$32,327	$89,738	$0
C2-Bunk	**N**	$58,097	$33,394	$52,150	$8,006	$12,275	$21,958
	R-Fed	$42,086	$19,213	$31,565	$5,185	$8,997	$7,777
	R-ST	$7,319	$19,671	$42,544	$3,888	$9,912	$0
	R-3	$43,001	$18,298	$38,884	$5,566	$9,988	$6,862

Table 19: Cost Impact of Oiling of Port Areas and Access in Oil Spill Scenarios							
Scenario	Response	Savings to Port Due to Port Business Disruption					
		5th	50th	95th	Mean	Mean+2SD	Mean-2SD
SI-Crud	N	$455,085	$254,577	$210,646	$307,520	$567,729	$46,184
	R-Fed	$51,817	$38,299	$83,357	$57,449	$104,760	$11,264
	R-ST	$31,541	$33,793	$72,093	$46,184	$91,242	$0
	R-3	$22,529	$32,667	$58,575	$38,299	$75,472	$0
	C-Fed	$21,402	$33,793	$59,702	$38,299	$76,598	$0
	C-ST	$25,908	$37,173	$69,840	$45,058	$90,116	$0
	C-3	$21,402	$33,793	$59,702	$38,299	$76,598	$0
IS-Crud	N	$382,992	$304,141	$1,148,976	$608,281	$1,757,258	$0
	R-Fed	$112,645	$112,645	$146,438	$123,909	$349,199	$0
	R-ST	$90,116	$101,380	$90,116	$90,116	$236,554	$0
	R-3	$67,587	$90,116	$67,587	$78,851	$180,232	$0
	C-Fed	$112,645	$101,380	$123,909	$112,645	$304,141	$0
	C-ST	$67,587	$67,587	$22,529	$56,322	$112,645	$0
	C-3	$67,587	$123,909	$157,703	$112,645	$315,405	$0
S1-Bunk	N	$384,118	$509,154	$349,199	$413,406	$921,434	$84,484
	R-Fed	$145,312	$52,943	$157,703	$118,277	$272,600	$14,644
	R-ST	$145,312	$34,920	$242,186	$140,806	$361,590	$16,897
	R-3	$70,966	$47,311	$154,323	$91,242	$272,600	$0
	R-ISB	$144,185	$78,851	$66,460	$96,874	$233,175	$0
S1-Dies	N	$0	$6,008	$0	$1,877	$8,636	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
S2-Crud	N	$528,304	$154,323	$243,313	$308,647	$737,823	$27,035
	R-Fed	$121,656	$56,322	$55,196	$77,725	$161,082	$32,667
	R-ST	$68,713	$31,541	$55,196	$51,817	$137,427	$0
	R-3	$38,299	$49,564	$51,817	$46,184	$136,300	$0
	R-ISB	$57,449	$25,908	$51,817	$45,058	$134,047	$0
	C-Fed	$545,200	$272,600	$253,451	$357,084	$705,156	$52,943
	C-ST	$38,299	$29,288	$51,817	$39,426	$130,668	$0
	C-3	$88,989	$51,817	$66,460	$68,713	$118,277	$28,161
OC-Crud	N	$33,793	$416,785	$352,578	$268,094	$704,030	$0
	R-Fed	$31,541	$174,599	$233,175	$146,438	$355,957	$0
	R-ST	$32,667	$168,967	$224,163	$141,932	$342,440	$0
	R-3	$27,035	$153,197	$215,151	$131,794	$325,543	$0
	R-ISB	$37,173	$171,220	$220,784	$143,059	$336,808	$0
	C-Fed	$30,414	$163,335	$229,795	$140,806	$346,946	$0
	C-ST	$30,414	$170,094	$223,037	$140,806	$344,693	$0
	C-3	$27,035	$148,691	$217,404	$130,668	$325,543	$0
C1-Bunk	N	$0	$389,872	$487,653	$438,919	$577,311	$300,214
	R-Fed	$10,622	$154,949	$273,036	$146,202	$409,241	$0
	R-ST	$10,622	$106,528	$267,413	$128,083	$387,686	$0
	R-3	$10,622	$141,829	$245,232	$132,457	$367,692	$0
C2-Bunk	N	$39,675	$22,805	$35,613	$32,802	$50,296	$14,995
	R-Fed	$28,741	$13,121	$21,555	$21,243	$36,863	$5,311
	R-ST	$4,998	$13,433	$29,053	$15,932	$40,612	$0
	R-3	$29,365	$12,496	$26,554	$22,805	$40,924	$4,686

Marinas

Impacts to marinas included the cost of daily lost income from actual marina data on moorage fees and other income per berth in the marina (as presented on marina websites) for the time that the marina would be unusable or severely compromised, and the cost of having to clean boats and berths on a per-boat, or per-berth basis. The cleaning costs for boats were based on personal communications with marina operators and commercial marine businesses. The costs for cleaning were adjusted to take into account the persistence of the oil, visibility, and ease of cleanup based on oil type. The costs for diesel cleanups were $200 per boat, $500 per boat for heavy fuel oil (bunker), and $300 per boat for crude oil. (Table 20) Results are shown in Tables 21 and 22.

Table 20: Marinas Potentially Impacted by Oil Spill Scenarios

Modeling Location	Marinas	Total Berths	Daily Lost Income[1]	Damage to Boats and Marina Property[2]		
				Diesel	Bunker	Crude
Portland	Parkers Landing	356	$7,120	$71,200	$178,000	$106,800
	Port of Ilwaco	800	$16,000	$160,000	$400,000	$240,000
	TOTAL	**1,156**	**$23,120**	**$231,200**	**$578,000**	**$346,800**
Ports North	Blaine Harbor	600	$12,000	$120,000	$300,000	$180,000
	Friday Harbor Marina	500	$10,000	$100,000	$250,000	$150,000
	LaConner Marina	460	$9,200	$92,000	$230,000	$138,000
	Lopez Islander Resort	160	$3,200	$32,000	$80,000	$48,000
	Oak Harbor Marina	420	$8,400	$84,000	$210,000	$126,000
	Port of Edmonds	676	$13,520	$135,200	$338,000	$202,800
	Shishole Marina	1,500	$30,000	$300,000	$750,000	$450,000
	Squalicum Harbor	1,404	$28,080	$280,800	$702,000	$421,200
	TOTAL	**5,720**	**$114,400**	**$1,144,000**	**$2,860,000**	**$1,716,000**
Ports South	Bell Harbor Marina	70	$1,400	$14,000	$35,000	$21,000
	Bremerton Marina	25	$500	$5,000	$12,500	$7,500
	City of DesMoines Marina	840	$16,800	$168,000	$420,000	$252,000
	Elliot Bay Marina	1,200	$24,000	$240,000	$600,000	$360,000
	Harbor Island Marina	80	$1,600	$16,000	$40,000	$24,000
	Point Hudson Marina	45	$900	$9,000	$22,500	$13,500
	Port of Brownsville Marina	415	$8,300	$83,000	$207,500	$124,500
	Port of Everett Marina	2,050	$41,000	$410,000	$1,025,000	$615,000
	Port of Kingston Marina	320	$6,400	$64,000	$160,000	$96,000
	Port of Poulsbo Marina	130	$2,600	$26,000	$65,000	$39,000
	Port Orchard Marina	130	$2,600	$26,000	$65,000	$39,000
	Port Townsend Haven	6,000	$120,000	$1,200,000	$3,000,000	$1,800,000
	Salmon Bay Marina	168	$3,360	$33,600	$84,000	$50,400
	Swantown Marina	700	$14,000	$140,000	$350,000	$210,000
	TOTAL	**12,173**	**$243,460**	**$2,434,600**	**$6,086,500**	**$3,651,900**
Str Juan de Fuca South	Port Angeles Marina	520	$10,400	$104,000	$260,000	$156,000
	TOTAL	**520**	**$10,400**	**$104,000**	**$260,000**	**$156,000**
Vancouver	Bayshore West Marina	400	$8,000	$80,000	$200,000	$120,000
	Coal Harbor Marina	238	$4,760	$47,600	$119,000	$71,400
	Pelican Bay Marina	600	$12,000	$120,000	$300,000	$180,000
	Royal Vancouver YC	500	$10,000	$100,000	$250,000	$150,000
	Shelter Island Marina	400	$8,000	$80,000	$200,000	$120,000
	Vancouver Marina	400	$8,000	$80,000	$200,000	$120,000
	TOTAL	**2,538**	**$50,760**	**$507,600**	**$1,269,000**	**$761,400**

[1]Based on extrapolated marina income from actual marina data (moorage fees and other income, estimated at $20).
[2]Based on cost of boat cleanup as per personal communications with marina representatives and oil type factors (persistence, visibility, ease of removal) – $200/boat diesel; $500/boat heavy fuel oil, and $300/boat crude oil.

Table 21: Oiling of Marina Areas in Oil Spill Scenarios							
Scenario	**Response**	**% Area Covered by Oil (> 0.01 g/m^2)**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	4.04%	2.26%	1.87%	2.73%	5.04%	0.41%
	R-Fed	0.46%	0.34%	0.74%	0.51%	0.93%	0.10%
	R-ST	0.28%	0.30%	0.64%	0.41%	0.81%	0.00%
	R-3	0.20%	0.29%	0.52%	0.34%	0.67%	0.00%
	C-Fed	0.19%	0.30%	0.53%	0.34%	0.68%	0.00%
	C-ST	0.23%	0.33%	0.62%	0.40%	0.80%	0.00%
	C-3	0.19%	0.30%	0.53%	0.34%	0.68%	0.00%
IS-Crud	**N**	3.40%	2.70%	10.20%	5.40%	15.60%	0.00%
	R-Fed	1.00%	1.00%	1.30%	1.10%	3.10%	0.00%
	R-ST	0.80%	0.90%	0.80%	0.80%	2.10%	0.00%
	R-3	0.60%	0.80%	0.60%	0.70%	1.60%	0.00%
	C-Fed	1.00%	0.90%	1.10%	1.00%	2.70%	0.00%
	C-ST	0.60%	0.60%	0.20%	0.50%	1.00%	0.00%
	C-3	0.60%	1.10%	1.40%	1.00%	2.80%	0.00%
S1-Bunk	**N**	3.41%	4.52%	3.10%	3.67%	8.18%	0.75%
	R-Fed	1.29%	0.47%	1.40%	1.05%	2.42%	0.13%
	R-ST	1.29%	0.31%	2.15%	1.25%	3.21%	0.15%
	R-3	0.63%	0.42%	1.37%	0.81%	2.42%	0.00%
	R-ISB	1.28%	0.70%	0.59%	0.86%	2.07%	0.00%
S1-Dies	**N**	0.00%	0.16%	0.00%	0.05%	0.23%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
S2-Crud	**N**	4.69%	1.37%	2.16%	2.74%	6.55%	0.24%
	R-Fed	1.08%	0.50%	0.49%	0.69%	1.43%	0.29%
	R-ST	0.61%	0.28%	0.49%	0.46%	1.22%	0.00%
	R-3	0.34%	0.44%	0.46%	0.41%	1.21%	0.00%
	R-ISB	0.51%	0.23%	0.46%	0.40%	1.19%	0.00%
	C-Fed	4.84%	2.42%	2.25%	3.17%	6.26%	0.47%
	C-ST	0.34%	0.26%	0.46%	0.35%	1.16%	0.00%
	C-3	0.79%	0.46%	0.59%	0.61%	1.05%	0.25%
OC-Crud	**N**	0.30%	3.70%	3.13%	2.38%	6.25%	0.00%
	R-Fed	0.28%	1.55%	2.07%	1.30%	3.16%	0.00%
	R-ST	0.29%	1.50%	1.99%	1.26%	3.04%	0.00%
	R-3	0.24%	1.36%	1.91%	1.17%	2.89%	0.00%
	R-ISB	0.33%	1.52%	1.96%	1.27%	2.99%	0.00%
	C-Fed	0.27%	1.45%	2.04%	1.25%	3.08%	0.00%
	C-ST	0.27%	1.51%	1.98%	1.25%	3.06%	0.00%
	C-3	0.24%	1.32%	1.93%	1.16%	2.89%	0.00%
C1-Bunk	**N**	0.00%	12.48%	15.61%	14.05%	18.48%	9.61%
	R-Fed	0.34%	4.96%	8.74%	4.68%	13.10%	0.00%
	R-ST	0.34%	3.41%	8.56%	4.10%	12.41%	0.00%
	R-3	0.34%	4.54%	7.85%	4.24%	11.77%	0.00%
C2-Bunk	**N**	1.27%	0.73%	1.14%	1.05%	1.61%	0.48%
	R-Fed	0.92%	0.42%	0.69%	0.68%	1.18%	0.17%
	R-ST	0.16%	0.43%	0.93%	0.51%	1.30%	0.00%
	R-3	0.94%	0.40%	0.85%	0.73%	1.31%	0.15%

Table 22: Income Loss and Damages from Oiling of Marina Areas in Oil Spill Scenarios							
Scenario	**Response**	**Total Costs of Marina Oiling Impacts**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$324,985	$125,417	$103,588	$150,807	$279,006	$22,844
	R-Fed	$37,196	$18,779	$41,011	$28,461	$51,247	$5,667
	R-ST	$22,768	$16,330	$35,277	$22,425	$44,704	$139
	R-3	$16,145	$15,904	$28,826	$18,613	$36,948	$273
	C-Fed	$15,390	$16,377	$29,167	$18,711	$37,730	$0
	C-ST	$18,729	$18,342	$34,288	$21,840	$44,088	$0
	C-3	$15,390	$16,377	$29,167	$18,711	$37,730	$0
IS-Crud	**N**	$273,293	$149,530	$564,592	$300,599	$865,258	$0
	R-Fed	$80,380	$55,281	$71,865	$60,823	$171,384	$0
	R-ST	$64,304	$49,745	$44,221	$44,218	$116,072	$0
	R-3	$48,228	$44,211	$33,164	$38,685	$88,429	$0
	C-Fed	$80,380	$49,753	$60,804	$55,285	$149,258	$0
	C-ST	$48,228	$33,158	$11,053	$27,624	$55,260	$0
	C-3	$48,228	$60,791	$77,399	$55,298	$154,787	$0
S1-Bunk	**N**	$354,697	$357,588	$245,696	$290,855	$647,992	$59,568
	R-Fed	$134,853	$36,927	$110,522	$83,295	$191,283	$10,655
	R-ST	$134,423	$24,241	$169,901	$98,804	$254,070	$12,175
	R-3	$65,619	$33,550	$108,040	$63,824	$191,354	$0
	R-ISB	$133,826	$55,214	$47,024	$67,923	$163,910	$0
S1-Dies	**N**	$76	$6,546	$21	$2,210	$9,782	$0
	R-Fed	$9	$21	$22	$17	$45	$0
	R-ST	$36	$23	$22	$25	$55	$2
	R-3	$5	$10	$25	$13	$37	$1
S2-Crud	**N**	$376,983	$76,009	$119,184	$151,599	$362,484	$13,081
	R-Fed	$86,811	$27,631	$26,872	$37,967	$78,935	$15,771
	R-ST	$49,032	$15,469	$26,817	$25,270	$67,582	$0
	R-3	$27,329	$24,201	$25,514	$22,893	$66,767	$0
	R-ISB	$40,994	$12,565	$25,400	$22,009	$65,860	$0
	C-Fed	$389,040	$134,003	$124,743	$175,421	$346,542	$26,182
	C-ST	$27,329	$14,140	$25,210	$19,455	$64,282	$0
	C-3	$63,500	$25,414	$32,335	$33,856	$57,785	$13,764
OC-Crud	**N**	$24,034	$204,557	$173,164	$131,547	$345,687	$0
	R-Fed	$22,558	$85,594	$114,337	$71,873	$174,858	$0
	R-ST	$23,543	$83,121	$110,252	$69,908	$168,033	$0
	R-3	$19,605	$74,991	$105,378	$64,666	$159,512	$0
	R-ISB	$26,331	$83,827	$108,279	$70,123	$165,569	$0
	C-Fed	$21,410	$79,887	$112,848	$69,210	$170,126	$0
	C-ST	$21,820	$83,307	$109,509	$69,327	$169,233	$0
	C-3	$1,733	$7,659	$11,142	$6,736	$16,726	$0
C1-Bunk	**N**	$0	$72,134	$90,676	$81,716	$107,415	$55,956
	R-Fed	$2,437	$28,673	$50,617	$27,145	$75,860	$0
	R-ST	$2,437	$19,712	$49,544	$23,779	$71,847	$0
	R-3	$2,437	$26,245	$45,455	$24,584	$68,146	$0
C2-Bunk	**N**	$9,102	$4,222	$6,591	$6,072	$9,310	$2,776
	R-Fed	$6,594	$2,428	$3,989	$3,931	$6,822	$983
	R-ST	$1,147	$2,486	$5,376	$2,949	$7,516	$0
	R-3	$6,737	$2,313	$4,914	$4,221	$7,574	$867

Shellfishing

Economic impacts of the oil spill scenarios on shellfishing were examined in two ways. The first method valued the amount (weight) of shellfish directly killed by the oil (Table 23) by wholesale market value (Table 24).

Table 23: Pounds of Shellfish Killed by Oil Spill Scenarios

Scenario	Response	5th	50th	95th	Mean	Mean+2SD	Mean-2SD
SI-Crud	N	21,457	13,861	14,066	16,461	33,230	1,972
	R-Fed	1,496	6,780	4,382	4,219	12,649	0
	R-ST	1,219	6,209	2,621	4,003	9,492	0
	R-3	1,306	5,986	2,075	3,122	8,832	0
	C-Fed	4,974	6,039	4,205	5,073	12,394	0
	C-ST	2,359	6,649	3,164	4,057	10,160	0
	C-3	1,413	6,900	2,018	3,443	10,070	5
IS-Crud	N	5,934	13,829	16,578	12,114	34,428	0
	R-Fed	31	6,247	1,007	2,428	10,731	0
	R-ST	0	8,786	724	4,065	16,067	0
	R-3	0	6,819	409	2,409	10,755	0
	C-Fed	26,830	24,006	19,579	23,472	32,675	14,966
	C-ST	15,834	17,752	21,341	18,309	23,924	12,952
	C-3	11,224	15,688	21,167	16,027	25,997	6,185
S1-Bunk	N	326	326	521	391	615	167
	R-Fed	3	3	132	46	195	3
	R-ST	3	3	229	259	1,118	3
	R-3	3	3	100	35	147	3
	R-ISB	3	3	3	3	3	3
S1-Dies	N	18,524	12,656	16,558	15,913	23,206	9,738
	R-Fed	10,798	15,771	16,353	14,307	21,581	8,523
	R-ST	20,557	23,790	30,113	25,707	34,587	17,436
	R-3	10,744	16,142	16,149	14,345	21,826	8,294
S2-Crud	N	5,544	3,438	3,300	4,094	7,798	511
	R-Fed	936	1,111	3,103	1,717	4,139	465
	R-ST	905	1,272	3,076	1,528	3,045	521
	R-3	927	1,122	2,952	1,667	3,929	628
	R-ISB	907	1,000	2,875	1,594	3,820	512
	C-Fed	3,323	1,582	3,081	2,662	6,331	189
	C-ST	3,247	1,550	3,026	2,607	6,127	231
	C-3	2,666	1,571	3,081	2,439	5,302	747
OC-Crud	N	0	43	1,274	150	713	0
	R-Fed	0	0	0	0	0	0
	R-ST	0	0	0	0	0	0
	R-3	19	0	0	6	29	0
	R-ISB	0	0	0	0	0	0
	C-Fed	0	0	0	0	0	0
	C-ST	0	0	0	0	0	0
	C-3	0	0	0	0	0	0
C1-Bunk	N	163	189	178	176	202	150
	R-Fed	19	60	59	46	92	0
	R-ST	15	56	62	22	61	0
	R-3	19	40	45	35	63	6
C2-Bunk	N	0	0	0	0	0	0
	R-Fed	0	0	0	0	0	0
	R-ST	0	0	0	0	0	0
	R-3	0	0	0	0	0	0

Table 24: Shellfish Wholesale Prices		
Shellfish	**$/kg**	**$/lb**
Oyster	$2.23	$1.01
Clam	$5.95	$2.69
Mussel	$3.48	$1.57
Geoduck	$19.33	$8.75

Costs were pro-rated, assuming that the percentage of annual catch would be proportional to the annual harvest shown in Table 25. British Columbia shellfishing was determined to be $30 million annually (wholesale). Estimated shellfish catch losses are in Table 26.

Table 25: Washington Annual Shellfish Income			
Shellfish	**Annual Harvest**		**Annual Income**
	Pounds	**Kilograms**	
Oyster	77,000,000	34,841,629	$77,904,750
Clam	7,000,000	3,167,421	$18,886,000
Mussel	1,500,000	678,733	$2,360,750
Geoduck	500,000	226,244	$4,384,250
TOTAL	**86,000,000**	**38,914,027**	**$103,535,750**
(Weighted Average Income)	**$1.20/lb or $2.66/kg**		
Source: Puget Sound Action Team July 2003 *Shellfish Economy*. Wholesale costs adjusted to 2003 dollars.			

The second method involved mapping of shoreline and nearshore shellfishing areas (Figure 7) and determining what area percentages were impacted by oil at 0.01g/m^2 or higher using the SIMAP modeling (Table 27). Deeper areas used for geoduck shellfishing were also included (not shown in Figure 7). Shellfishing income (Table 25) was assumed to be reduced by percentage area impacted for four months. Results are in Table 28.

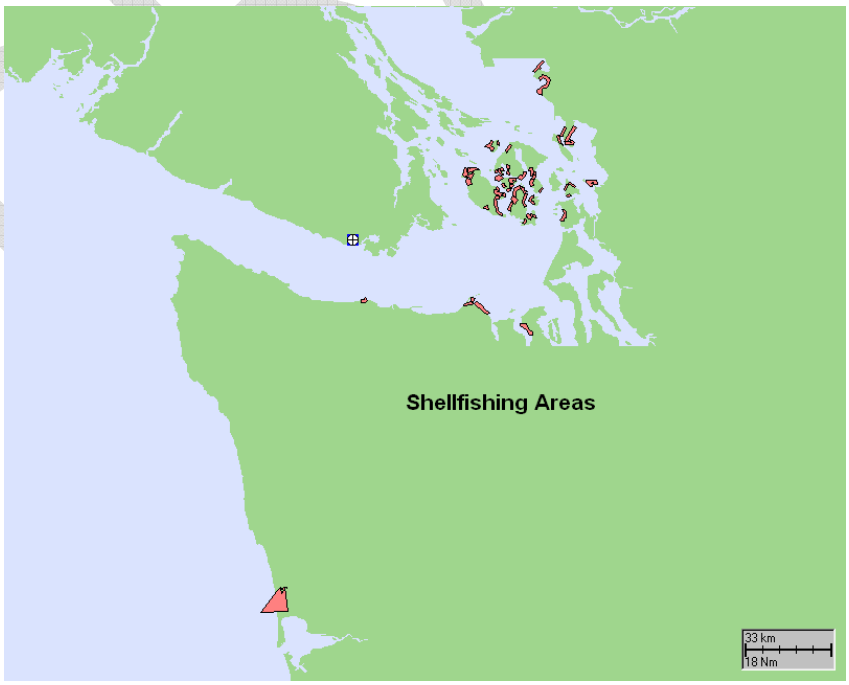


Figure X: Shellfishing Areas (excluding subtidal geoducks) modeled

Table 26: Shellfishing Impact by Oil Spill Scenarios							
Scenario	**Response**	**Wholesale Market Value of Killed Shellfish**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$57,076	$36,870	$37,416	$43,787	$88,392	$5,244
	R-Fed	$3,980	$18,034	$11,656	$11,223	$33,647	$0
	R-ST	$3,243	$16,516	$6,973	$10,649	$25,249	$0
	R-3	$3,474	$15,924	$5,519	$8,306	$23,492	$0
	C-Fed	$13,231	$16,065	$11,185	$13,494	$32,967	$0
	C-ST	$6,276	$17,687	$8,416	$10,793	$27,026	$0
	C-3	$3,757	$18,354	$5,367	$9,160	$26,786	$13
IS-Crud	**N**	$15,784	$36,786	$44,098	$32,223	$91,579	$0
	R-Fed	$84	$16,617	$2,678	$6,459	$28,546	$0
	R-ST	$0	$23,372	$1,925	$10,814	$42,739	$0
	R-3	$0	$18,138	$1,088	$6,409	$28,609	$0
	C-Fed	$71,369	$63,855	$52,081	$62,435	$86,917	$39,809
	C-ST	$42,117	$47,221	$56,767	$48,702	$63,638	$34,454
	C-3	$29,856	$41,731	$56,305	$42,631	$69,152	$16,452
S1-Bunk	**N**	$868	$868	$1,385	$1,041	$1,637	$444
	R-Fed	$7	$7	$352	$122	$520	$7
	R-ST	$7	$7	$610	$690	$2,973	$7
	R-3	$7	$7	$265	$93	$392	$7
	R-ISB	$7	$7	$7	$7	$7	$7
S1-Dies	**N**	$49,273	$33,666	$44,044	$42,327	$61,727	$25,904
	R-Fed	$28,723	$41,951	$43,499	$38,058	$57,405	$22,672
	R-ST	$54,682	$63,282	$80,101	$68,382	$92,001	$46,379
	R-3	$28,580	$42,939	$42,955	$38,158	$58,057	$22,061
S2-Crud	**N**	$14,748	$9,144	$8,777	$10,890	$20,742	$1,358
	R-Fed	$2,489	$2,955	$8,255	$4,566	$11,009	$1,236
	R-ST	$2,407	$3,384	$8,182	$4,063	$8,099	$1,387
	R-3	$2,466	$2,984	$7,852	$4,434	$10,451	$1,670
	R-ISB	$2,413	$2,660	$7,647	$4,240	$10,160	$1,361
	C-Fed	$8,839	$4,207	$8,195	$7,080	$16,840	$504
	C-ST	$8,636	$4,123	$8,049	$6,936	$16,299	$614
	C-3	$7,092	$4,180	$8,195	$6,489	$14,104	$1,986
OC-Crud	**N**	$0	$114	$3,388	$400	$1,896	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$52	$0	$0	$17	$77	$0
	R-ISB	$0	$0	$0	$0	$0	$0
	C-Fed	$0	$0	$0	$0	$0	$0
	C-ST	$0	$0	$0	$0	$0	$0
	C-3	$0	$0	$0	$0	$0	$0
C1-Bunk	**N**	$433	$502	$472	$469	$538	$399
	R-Fed	$51	$159	$156	$122	$245	$0
	R-ST	$40	$148	$164	$58	$162	$0
	R-3	$50	$107	$121	$92	$168	$17
C2-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
Based on pro-rated costs as in Table 25.							

Table 27: Shellfishing Areas Impacted by Oil Spill Scenarios							
Scenario	**Response**	**% Total Intertidal Shellfishing Areas Impacted**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	10.6%	3.7%	3.8%	6.1%	4.0%	14.0%
	R-Fed	0.5%	1.1%	2.2%	1.3%	0.9%	3.0%
	R-ST	0.3%	0.8%	1.8%	1.0%	0.8%	2.5%
	R-3	0.3%	0.9%	1.3%	0.8%	0.5%	1.9%
	C-Fed	0.3%	0.9%	1.1%	0.8%	0.4%	1.6%
	C-ST	0.3%	0.9%	1.8%	1.0%	0.8%	2.5%
	C-3	0.3%	0.9%	1.1%	0.8%	0.4%	1.6%
IS-Crud	**N**	2.08%	2.74%	9.49%	4.77%	12.97%	0.00%
	R-Fed	0.00%	0.12%	1.04%	0.41%	1.50%	0.00%
	R-ST	0.06%	0.03%	0.58%	0.20%	0.85%	0.00%
	R-3	0.03%	0.00%	0.52%	0.18%	0.77%	0.00%
	C-Fed	0.09%	0.00%	0.40%	0.16%	0.59%	0.00%
	C-ST	0.00%	0.00%	0.14%	0.05%	0.21%	0.00%
	C-3	2.08%	2.74%	9.49%	4.77%	12.97%	0.00%
S1-Bunk	**N**	0.00%	0.00%	0.02%	0.01%	0.03%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ISB	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
S1-Dies	**N**	0.02%	0.21%	0.00%	0.08%	0.31%	0.00%
	R-Fed	0.00%	0.09%	0.00%	0.03%	0.14%	0.00%
	R-ST	0.00%	0.07%	0.00%	0.02%	0.10%	0.00%
	R-3	0.00%	0.02%	0.00%	0.01%	0.03%	0.00%
S2-Crud	**N**	0.05%	0.00%	0.00%	0.02%	0.03%	0.07%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ISB	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-ST	0.46%	0.00%	0.67%	0.38%	0.34%	1.06%
	C-3	0.05%	0.00%	0.00%	0.02%	0.03%	0.07%
OC-Crud	**N**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ISB	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
C1-Bunk	**N**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
C2-Bunk	**N**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Table 28: Shellfishing Impacts of Oil Spill Scenarios							
Scenario	**Response**	**Cost of Shellfishing Closures[1]**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$3,455,363	$1,206,117	$1,238,715	$1,988,463	$1,303,910	$4,563,686
	R-Fed	$162,989	$358,575	$717,151	$423,771	$293,380	$977,933
	R-ST	$97,793	$260,782	$586,760	$325,978	$260,782	$814,944
	R-3	$97,793	$293,380	$423,771	$260,782	$162,989	$619,357
	C-Fed	$97,793	$293,380	$358,575	$260,782	$130,391	$521,564
	C-ST	$97,793	$293,380	$586,760	$325,978	$260,782	$814,944
	C-3	$97,793	$293,380	$358,575	$260,782	$130,391	$521,564
IS-Crud	**N**	$676,867	$893,093	$3,092,871	$1,554,277	$4,227,958	$0
	R-Fed	$0	$37,603	$338,428	$134,744	$487,660	$0
	R-ST	$18,132	$9,401	$188,018	$65,806	$277,692	$0
	R-3	$9,401	$47,004	$103,408	$53,271	$147,903	$0
	C-Fed	$9,401	$0	$169,214	$59,538	$249,735	$0
	C-ST	$28,202	$0	$131,612	$53,271	$191,860	$0
	C-3	$0	$0	$47,004	$15,668	$69,944	$0
S1-Bunk	**N**	$0	$0	$6,520	$3,260	$9,779	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
	R-ISB	$0	$0	$0	$0	$0	$0
S1-Dies	**N**	$6,520	$68,455	$0	$26,078	$101,053	$0
	R-Fed	$0	$29,338	$0	$9,779	$45,637	$0
	R-ST	$0	$22,818	$0	$6,520	$32,598	$0
	R-3	$0	$6,520	$0	$3,260	$9,779	$0
S2-Crud	**N**	$16,299	$0	$0	$6,520	$9,779	$22,818
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
	R-ISB	$0	$0	$0	$0	$0	$0
	C-Fed	$0	$0	$0	$0	$0	$0
	C-ST	$149,950	$0	$218,405	$123,871	$110,832	$345,536
	C-3	$16,299	$0	$0	$6,520	$9,779	$22,818
OC-Crud	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
	R-ISB	$0	$0	$0	$0	$0	$0
	C-Fed	$0	$0	$0	$0	$0	$0
	C-ST	$0	$0	$0	$0	$0	$0
	C-3	$0	$0	$0	$0	$0	$0
C1-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
C2-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0

[1]Intertidal shellfish only (excludes most geoducks). Total shellfish harvest equal to $271,648 per day. Shellfishing closures assumed to be four months based on perceptions of oiling.

Commercial Fishing

Commercial fishing (other than shellfishing) was also examined by two methods – direct impacts on fishing-catch wholesale losses, and by percentage area of impact (Figure 8) valued by annual commercial fishing income (daily fishing income of $4.4 million) for an estimated time of fishing ban of four months.

Figure 8: Commercial fishing, sportfishing and recreational boating areas in and around Washington State considered in spill scenario modeling.

The fishing-catch losses are shown in Table 29, with their corresponding wholesale values (estimated at $12 per kg or $5 per pound) in Table 30.

The estimated fishing area impacts by area (where floating oil met or exceeded 0.1 g/m^2) are shown in Table 31, with their corresponding fishing income values in Table 32.

Table 29: Pelagic and Demersal Fish Killed by Oil Spill Scenarios							
Scenario	**Response**	**Pounds of Pelagic and Demersal Fish Killed**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	1,061	9,331	289	3,561	13,587	0
	R-Fed	209	9,452	145	3,268	13,978	0
	R-ST	118	9,442	147	3,882	12,007	0
	R-3	156	8,551	77	2,928	12,667	0
	C-Fed	7,082	8,341	164	5,196	14,002	0
	C-ST	2,323	9,886	1,156	4,455	13,933	0
	C-3	277	10,391	87	3,585	15,375	0
IS-Crud	**N**	418	12,311	0	4,243	18,224	0
	R-Fed	0	8,846	0	2,949	13,164	0
	R-ST	0	12,948	0	5,176	21,824	0
	R-3	0	9,809	0	3,270	14,596	0
	C-Fed	41,733	37,227	28,811	35,924	49,041	22,806
	C-ST	24,190	27,251	32,474	27,972	36,350	19,594
	C-3	16,836	23,908	32,398	24,381	39,964	8,798
S1-Bunk	**N**	7	7	7	7	7	7
	R-Fed	7	7	7	7	7	7
	R-ST	7	7	7	7	7	7
	R-3	7	7	7	7	7	7
	R-ISB	7	7	7	7	7	7
S1-Dies	**N**	105,570	46,609	66,933	73,037	132,939	13,494
	R-Fed	25,569	83,914	69,467	59,650	120,422	2,596
	R-ST	47,182	74,764	111,582	88,718	157,645	19,791
	R-3	24,936	87,129	66,690	59,585	122,984	1,831
S2-Crud	**N**	0	4	13,503	4,503	20,092	0
	R-Fed	0	1,254	15,024	5,426	22,098	0
	R-ST	0	5,161	24,558	7,340	25,499	0
	R-3	0	1,517	9,785	3,767	14,300	0
	R-ISB	0	1	10,270	3,424	15,282	0
	C-Fed	54,872	12,663	13,694	27,076	75,231	0
	C-ST	53,018	11,896	13,929	26,281	72,636	0
	C-3	38,949	12,413	14,479	21,947	51,467	0
OC-Crud	**N**	3	3	3	3	5	2
	R-Fed	2	3	3	3	7	0
	R-ST	2	3	3	3	7	0
	R-3	3	3	3	3	5	1
	R-ISB	2	3	3	3	6	0
	C-Fed	2	2	3	2	5	1
	C-ST	2	2	3	2	5	0
	C-3	2	3	3	3	5	0
C1-Bunk	**N**	5	0	0	2	7	0
	R-Fed	0	0	0	0	0	0
	R-ST	1	0	0	0	3	0
	R-3	0	0	0	0	0	0
C2-Bunk	**N**	3,630	3,630	3,630	3,630	3,630	3,630
	R-Fed	3,630	3,630	3,630	3,630	3,630	3,630
	R-ST	3,630	3,630	3,630	3,630	3,630	3,630
	R-3	3,630	3,630	3,630	3,630	3,630	3,630

Table 30: Pelagic and Demersal Fish Killed by Oil Spill Scenarios							
Scenario	**Response**	**Wholesale Market Value of Killed Pelagic and Demersal Fish**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$12,737	$111,977	$3,469	$42,727	$163,039	$0
	R-Fed	$2,508	$113,418	$1,739	$39,222	$167,737	$0
	R-ST	$1,411	$113,308	$1,762	$46,588	$144,086	$0
	R-3	$1,875	$102,608	$925	$35,136	$152,006	$0
	C-Fed	$84,989	$100,091	$1,965	$62,348	$168,020	$0
	C-ST	$27,880	$118,628	$13,869	$53,459	$167,201	$0
	C-3	$3,322	$124,688	$1,039	$43,016	$184,499	$0
IS-Crud	**N**	$5,013	$147,735	$0	$50,916	$218,692	$0
	R-Fed	$0	$106,157	$0	$35,386	$157,965	$0
	R-ST	$0	$155,373	$0	$62,114	$261,887	$0
	R-3	$0	$117,706	$0	$39,235	$175,150	$0
	C-Fed	$500,796	$446,724	$345,731	$431,084	$588,498	$273,669
	C-ST	$290,281	$327,012	$389,693	$335,662	$436,197	$235,127
	C-3	$202,037	$286,899	$388,775	$292,570	$479,566	$105,575
S1-Bunk	**N**	$82	$82	$82	$82	$82	$82
	R-Fed	$82	$82	$82	$82	$82	$82
	R-ST	$82	$82	$82	$82	$82	$82
	R-3	$82	$82	$82	$82	$82	$82
	R-ISB	$82	$82	$82	$82	$82	$82
S1-Dies	**N**	$1,266,844	$559,304	$803,197	$876,448	$1,595,273	$161,925
	R-Fed	$306,826	$1,006,967	$833,605	$715,799	$1,445,068	$31,148
	R-ST	$566,179	$897,163	$1,338,983	$1,064,617	$1,891,741	$237,493
	R-3	$299,228	$1,045,549	$800,279	$715,019	$1,475,810	$21,974
S2-Crud	**N**	$4	$53	$162,037	$54,031	$241,105	$0
	R-Fed	$0	$15,049	$180,291	$65,113	$265,180	$0
	R-ST	$0	$61,929	$294,697	$88,079	$305,988	$0
	R-3	$0	$18,209	$117,416	$45,208	$171,604	$0
	R-ISB	$0	$8	$123,243	$41,084	$183,389	$0
	C-Fed	$658,463	$151,960	$164,325	$324,916	$902,768	$0
	C-ST	$636,222	$142,749	$167,153	$315,374	$871,634	$0
	C-3	$467,382	$148,962	$173,753	$263,366	$617,602	$0
OC-Crud	**N**	$31	$41	$39	$38	$58	$21
	R-Fed	$26	$41	$39	$35	$79	$3
	R-ST	$25	$41	$40	$35	$81	$2
	R-3	$32	$41	$40	$38	$64	$15
	R-ISB	$27	$41	$39	$36	$75	$6
	C-Fed	$26	$29	$35	$30	$54	$8
	C-ST	$25	$29	$35	$30	$59	$3
	C-3	$26	$32	$37	$32	$62	$5
C1-Bunk	**N**	$55	$0	$0	$18	$82	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$16	$0	$0	$2	$37	$0
	R-3	$0	$0	$0	$0	$0	$0
C2-Bunk	**N**	$43,556	$43,556	$43,556	$43,556	$43,556	$43,556
	R-Fed	$43,556	$43,556	$43,556	$43,556	$43,556	$43,556
	R-ST	$43,556	$43,556	$43,556	$43,556	$43,556	$43,556
	R-3	$43,556	$43,556	$43,556	$43,556	$43,556	$43,556
Based on estimated cost of $12 per kg or $5 per pound.							

Table 31: Commercial Fishing Areas Impacted by Oil Spill Scenarios							
Scenario	**Response**	**% Area Coverage**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	2.38%	1.10%	0.93%	1.47%	0.79%	3.06%
	R-Fed	0.22%	0.26%	0.48%	0.32%	0.14%	0.60%
	R-ST	0.12%	0.23%	0.42%	0.26%	0.15%	0.56%
	R-3	0.21%	0.23%	0.50%	0.32%	0.64%	0.00%
	C-Fed	0.13%	0.40%	0.70%	0.41%	0.29%	0.99%
	C-ST	0.09%	0.22%	0.45%	0.25%	0.18%	0.62%
	C-3	2.38%	1.10%	0.93%	1.47%	0.79%	3.06%
IS-Crud	**N**	1.79%	1.05%	4.01%	2.28%	1.54%	5.36%
	R-Fed	0.21%	0.50%	0.82%	0.70%	0.17%	1.04%
	R-ST	0.03%	0.49%	0.66%	0.53%	0.12%	0.77%
	R-3	0.33%	0.54%	0.52%	0.46%	0.11%	0.69%
	C-Fed	0.59%	0.43%	0.76%	0.59%	0.16%	0.92%
	C-ST	0.35%	0.42%	0.58%	0.45%	0.12%	0.69%
	C-3	0.25%	0.38%	0.51%	0.38%	0.13%	0.64%
S1-Bunk	**N**	2.01%	2.94%	1.83%	2.26%	0.59%	3.44%
	R-Fed	0.90%	0.29%	1.12%	0.77%	0.43%	1.63%
	R-ST	0.98%	0.29%	1.46%	0.91%	0.59%	2.09%
	R-3	0.38%	0.26%	0.79%	0.48%	0.28%	1.04%
	R-ISB	0.91%	0.42%	0.51%	0.61%	0.26%	1.13%
S1-Dies	**N**	1.52%	1.41%	0.75%	1.23%	2.06%	0.39%
	R-Fed	0.82%	0.51%	0.40%	0.58%	1.02%	0.14%
	R-ST	0.71%	0.58%	0.77%	0.69%	0.88%	0.49%
	R-3	0.10%	0.32%	0.85%	0.42%	1.19%	0.00%
S2-Crud	**N**	5.01%	1.67%	1.46%	2.72%	1.99%	6.70%
	R-Fed	1.05%	0.51%	0.53%	0.70%	0.30%	1.30%
	R-ST	0.63%	0.48%	0.53%	0.55%	0.07%	0.69%
	R-3	0.30%	0.49%	0.52%	0.44%	0.12%	0.68%
	R-ISB	0.62%	0.41%	0.50%	0.51%	0.11%	0.73%
	C-Fed	0.85%	0.42%	0.53%	0.60%	0.22%	1.05%
	C-ST	0.28%	0.37%	0.56%	0.40%	0.14%	0.69%
	C-3	1.00%	0.50%	1.15%	0.88%	0.34%	1.57%
OC-Crud	**N**	1.79%	2.79%	8.18%	4.25%	3.44%	11.13%
	R-Fed	1.29%	1.24%	1.70%	1.41%	0.25%	1.92%
	R-ST	1.51%	1.15%	1.69%	1.45%	0.27%	2.00%
	R-3	1.28%	1.18%	1.61%	1.36%	0.23%	1.81%
	R-ISB	1.36%	1.13%	1.56%	1.35%	0.22%	1.78%
	C-Fed	1.17%	1.09%	1.73%	1.33%	0.35%	2.03%
	C-ST	1.20%	1.19%	1.71%	1.37%	0.29%	1.96%
	C-3	1.30%	1.06%	1.58%	1.31%	0.26%	1.83%
C1-Bunk	**N**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
C2-Bunk	**N**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Table 32: Commercial Fishing Losses for Oil Spill Scenarios							
Scenario	**Response**	**Commercial Fishing Income Lost ($million)**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$12,566	$5,808	$4,910	$7,762	$4,171	$16,157
	R-Fed	$1,162	$1,373	$2,534	$1,690	$739	$3,168
	R-ST	$634	$1,214	$2,218	$1,373	$792	$2,957
	R-3	$1,109	$1,214	$2,640	$1,690	$3,379	$0
	C-Fed	$686	$2,112	$3,696	$2,165	$1,531	$5,227
	C-ST	$475	$1,162	$2,376	$1,320	$950	$3,274
	C-3	$12,566	$5,808	$4,910	$7,762	$4,171	$16,157
IS-Crud	**N**	$9,451	$5,544	$21,173	$12,038	$8,131	$28,301
	R-Fed	$1,109	$2,640	$4,330	$3,696	$898	$5,491
	R-ST	$158	$2,587	$3,485	$2,798	$634	$4,066
	R-3	$1,742	$2,851	$2,746	$2,429	$581	$3,643
	C-Fed	$3,115	$2,270	$4,013	$3,115	$845	$4,858
	C-ST	$1,848	$2,218	$3,062	$2,376	$634	$3,643
	C-3	$1,320	$2,006	$2,693	$2,006	$686	$3,379
S1-Bunk	**N**	$10,613	$15,523	$9,662	$11,933	$3,115	$18,163
	R-Fed	$4,752	$1,531	$5,914	$4,066	$2,270	$8,606
	R-ST	$5,174	$1,531	$7,709	$4,805	$3,115	$11,035
	R-3	$2,006	$1,373	$4,171	$2,534	$1,478	$5,491
	R-ISB	$4,805	$2,218	$2,693	$3,221	$1,373	$5,966
S1-Dies	**N**	$8,026	$7,445	$3,960	$6,494	$10,877	$2,059
	R-Fed	$4,330	$2,693	$2,112	$3,062	$5,386	$739
	R-ST	$3,749	$3,062	$4,066	$3,643	$4,646	$2,587
	R-3	$528	$1,690	$4,488	$2,218	$6,283	$0
S2-Crud	**N**	$26,453	$8,818	$7,709	$14,362	$10,507	$35,376
	R-Fed	$5,544	$2,693	$2,798	$3,696	$1,584	$6,864
	R-ST	$3,326	$2,534	$2,798	$2,904	$370	$3,643
	R-3	$1,584	$2,587	$2,746	$2,323	$634	$3,590
	R-ISB	$3,274	$2,165	$2,640	$2,693	$581	$3,854
	C-Fed	$4,488	$2,218	$2,798	$3,168	$1,162	$5,544
	C-ST	$1,478	$1,954	$2,957	$2,112	$739	$3,643
	C-3	$5,280	$2,640	$6,072	$4,646	$1,795	$8,290
OC-Crud	**N**	$9,451	$14,731	$43,190	$22,440	$18,163	$58,766
	R-Fed	$6,811	$6,547	$8,976	$7,445	$1,320	$10,138
	R-ST	$7,973	$6,072	$8,923	$7,656	$1,426	$10,560
	R-3	$6,758	$6,230	$8,501	$7,181	$1,214	$9,557
	R-ISB	$7,181	$5,966	$8,237	$7,128	$1,162	$9,398
	C-Fed	$6,178	$5,755	$9,134	$7,022	$1,848	$10,718
	C-ST	$6,336	$6,283	$9,029	$7,234	$1,531	$10,349
	C-3	$6,864	$5,597	$8,342	$6,917	$1,373	$9,662
C1-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
C2-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
Based on area impacted, daily fishing income of $4.4 million, and estimated time of fishing ban of four months.							

Damage to fishing boats and fishing gear (gill nets and other equipment) were also considered in this analysis.

Fishing boat damage was assumed to be the equivalent of the cost to remove oil from the boats, depending on oil type, as shown in Table 33. The fishing gear damage was estimated at $1,000 per boat based on information from the Pacific Coast Fisherman's Association.

It was assumed that at any one time 70% of the fishing fleet would be in areas potentially vulnerable to oiling. The vessels were assumed to be evenly distributed throughout the assumed fishing waters in Figure 8. The percentage area coverage for each scenario was taken into account in determining impacts on vessels. The number of commercial fishing vessels was assumed to be 2,835 commercial fishing vessels out of Seattle and 1,522 out of Portland; 1,500 out of British Columbia (documented <5,000 GT self-propelled with fisheries endorsement, according to US Coast Guard Marine Safety Information System).

Table 33: Damage Costs for Commercial Fishing Vessels

Oil Type	Damage to Gillnets/Equipment[1]	Damage to Boats[2]	Total Damage to Commercial Fishing Fleet (4,000 Boats) If All Impacted
Diesel	$1,000 *per boat*	$200 *per boat*	$4,800,000
Bunker C	$1,000 *per boat*	$500 *per boat*	$6,000,000
Crude Oil	$1,000 *per boat*	$300 *per boat*	$5,200,000

[1]Based on cost of gillnets and other equipment as per Pacific Coast Fisherman's Association. [2]Based on cost of boat cleanup as per personal communications with marina representatives and factors of oil persistence based on oil type.

Commercial fishing boat damages are shown in Table 34.

Table 34: Commercial Fishing Boat Damages for Oil Spill Scenarios							
Scenario	**Response**	**Commercial Fishing Damage ($million)**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$93,903	$43,401	$36,693	$57,999	$31,169	$120,732
	R-Fed	$8,680	$10,258	$18,938	$12,626	$5,524	$23,673
	R-ST	$4,735	$9,075	$16,571	$10,258	$5,918	$22,095
	R-3	$8,286	$9,075	$19,728	$12,626	$25,251	$0
	C-Fed	$5,129	$15,782	$27,619	$16,177	$11,442	$39,060
	C-ST	$3,551	$8,680	$17,755	$9,864	$7,102	$24,462
	C-3	$93,903	$43,401	$36,693	$57,999	$31,169	$120,732
IS-Crud	**N**	$70,624	$41,428	$158,215	$89,957	$60,761	$211,479
	R-Fed	$8,286	$19,728	$32,353	$27,619	$6,707	$41,033
	R-ST	$1,184	$19,333	$26,040	$20,911	$4,735	$30,380
	R-3	$13,020	$21,306	$20,517	$18,149	$4,340	$27,224
	C-Fed	$23,278	$16,966	$29,986	$23,278	$6,313	$36,299
	C-ST	$13,809	$16,571	$22,884	$17,755	$4,735	$27,224
	C-3	$9,864	$14,993	$20,122	$14,993	$5,129	$25,251
S1-Bunk	**N**	$91,505	$133,844	$83,311	$102,887	$26,860	$156,606
	R-Fed	$40,973	$13,202	$50,988	$35,054	$19,576	$74,206
	R-ST	$44,615	$13,202	$66,467	$41,428	$26,860	$95,147
	R-3	$17,300	$11,837	$35,965	$21,852	$12,747	$47,346
	R-ISB	$41,428	$19,121	$23,218	$27,770	$11,837	$51,443
S1-Dies	**N**	$55,358	$51,352	$27,315	$44,797	$75,025	$14,204
	R-Fed	$29,864	$18,574	$14,568	$21,124	$37,148	$5,099
	R-ST	$25,858	$21,124	$28,043	$25,130	$32,050	$17,846
	R-3	$3,642	$11,654	$30,957	$15,296	$43,340	$0
S2-Crud	**N**	$197,670	$65,890	$57,604	$107,318	$78,515	$264,349
	R-Fed	$41,428	$20,122	$20,911	$27,619	$11,837	$51,292
	R-ST	$24,857	$18,938	$20,911	$21,700	$2,762	$27,224
	R-3	$11,837	$19,333	$20,517	$17,360	$4,735	$26,829
	R-ISB	$24,462	$16,177	$19,728	$20,122	$4,340	$28,802
	C-Fed	$33,537	$16,571	$20,911	$23,673	$8,680	$41,428
	C-ST	$11,047	$14,598	$22,095	$15,782	$5,524	$27,224
	C-3	$39,455	$19,728	$45,373	$34,720	$13,415	$61,944
OC-Crud	**N**	$70,624	$110,079	$322,742	$167,684	$135,725	$439,134
	R-Fed	$50,897	$48,924	$67,074	$55,632	$9,864	$75,754
	R-ST	$59,577	$45,373	$66,679	$57,210	$10,653	$78,910
	R-3	$50,502	$46,557	$63,523	$53,659	$9,075	$71,414
	R-ISB	$53,659	$44,584	$61,550	$53,264	$8,680	$70,230
	C-Fed	$46,162	$43,006	$68,257	$52,475	$13,809	$80,094
	C-ST	$47,346	$46,951	$67,468	$54,053	$11,442	$77,332
	C-3	$51,292	$41,822	$62,339	$51,686	$10,258	$72,203
C1-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
C2-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
Based on percentage of area impacted, size of fishing fleet (assuming 70% out in water at any one time) and costs shown in Table X.							

Tribal Nations

Impacts to Tribal Nations areas (shown in Figure 9), were recorded in terms of area of oiling. The results are shown in Table 35. No attempt was made to place any value on this oiling, as according to several sources in state agencies involved in Tribal Nations affairs, Tribal spokespersons have noted that the value of this land and adjacent waters is not quantifiable due to the sacred, moral, and ethical values associated with these lands and waters.

Tribal members may experience loss of income associated with commercial fishing. By treaty agreement, 50% of all commercial fishing income goes to tribes. 50% of the losses noted under Commercial Fishing and Shellfishing would impact Tribal Nations. Total income losses for tribes are shown in Table 36. Note that any economic impacts on the Tribal Nations in terms of lost wages or livelihood may be somewhat offset by income from shoreline cleanup and other oil spill response activities, which often involve the hiring of local workers. Impacts to *subsistence* fishing associated with Tribal Nations is described under Subsistence Fishing.

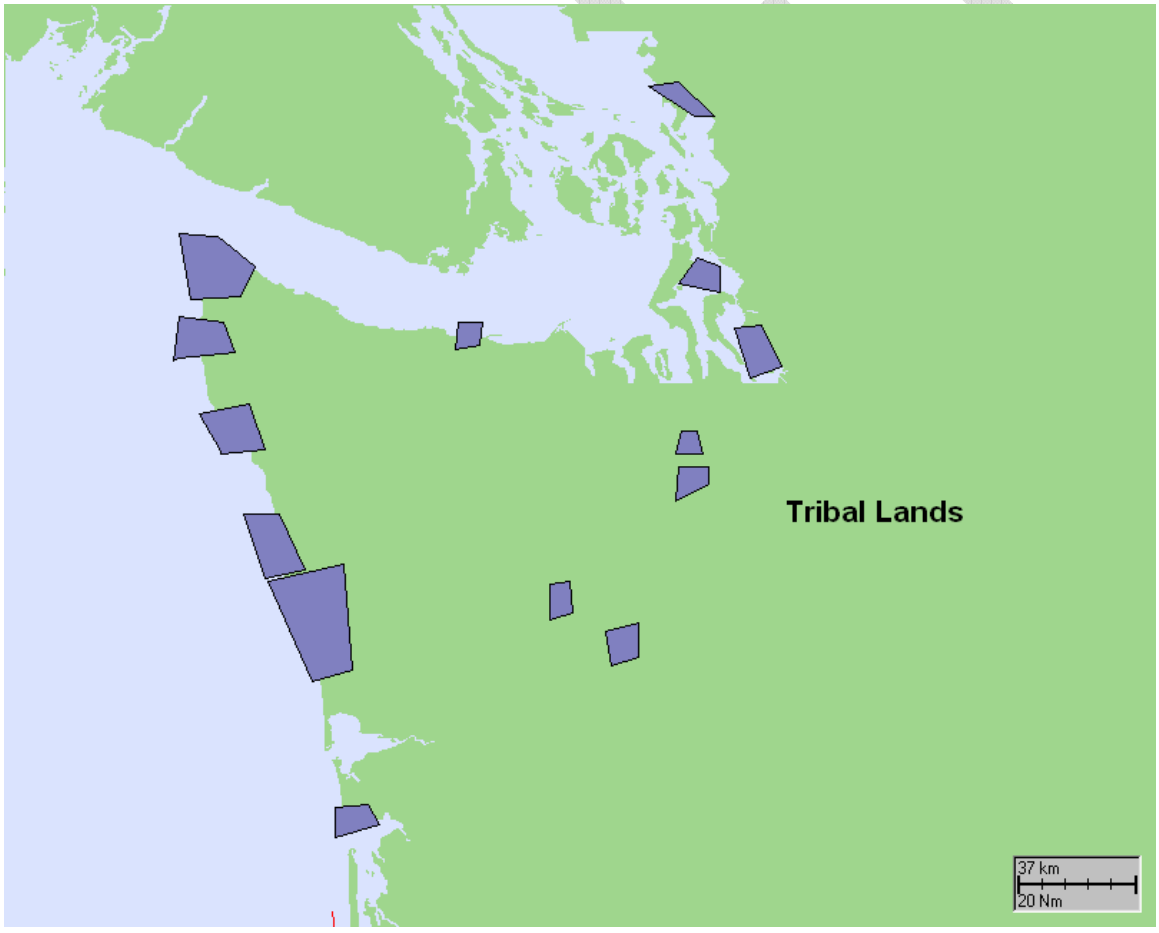


Figure 9: Tribal Nations locations included in modeling.

Table 35: Oiling of Tribal Nations Lands by Oil Spill Scenarios							
Scenario	**Response**	**% Area Covered by Oil (> 0.01 g/m^2)**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	0.59%	0.78%	0.51%	0.63%	0.14%	0.91%
	R-Fed	0.00%	0.05%	0.00%	0.02%	0.03%	0.08%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
IS-Crud	**N**	0.00%	0.00%	0.87%	0.29%	0.50%	1.29%
	R-Fed	0.05%	0.00%	0.08%	0.03%	0.05%	0.12%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-Fed	0.59%	0.78%	0.51%	0.63%	0.14%	0.91%
	C-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-3	0.00%	0.00%	0.87%	0.29%	0.50%	1.29%
S1-Bunk	**N**	0.00%	2.37%	0.00%	0.79%	3.53%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ISB	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
S1-Dies	**N**	0.00%	0.00%	2.09%	0.70%	3.11%	0.00%
	R-Fed	0.00%	0.00%	2.62%	0.87%	3.90%	0.00%
	R-ST	0.00%	0.06%	1.84%	0.63%	2.72%	0.00%
	R-3	0.00%	0.00%	1.67%	0.56%	2.49%	0.00%
S2-Crud	**N**	0.00%	1.53%	0.00%	0.51%	2.28%	0.00%
	R-Fed	0.00%	0.03%	0.00%	0.01%	0.04%	0.00%
	R-ST	0.00%	0.20%	0.00%	0.07%	0.29%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ISB	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
OC-Crud	**N**	0.00%	0.45%	0.28%	0.24%	0.23%	0.70%
	R-Fed	0.00%	0.96%	0.06%	0.34%	0.54%	1.41%
	R-ST	0.00%	0.67%	0.11%	0.26%	0.36%	0.99%
	R-3	0.00%	0.22%	0.00%	0.07%	0.13%	0.33%
	R-ISB	0.00%	1.18%	0.06%	0.41%	0.67%	1.74%
	C-Fed	0.00%	1.01%	0.06%	0.36%	0.57%	1.49%
	C-ST	1.41%	0.00%	0.06%	0.49%	0.80%	2.08%
	C-3	0.00%	1.01%	0.06%	0.36%	0.57%	1.49%
C1-Bunk	**N**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
C2-Bunk	**N**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Table 36: Fishing Income Losses of Tribal Nations Lands by Oil Spill Scenarios							
Scenario	**Response**	**Dollars Income Lost (50% of Commercial Fishing Catch)**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$6,369	$55,989	$1,735	$21,364	$81,520	$0
	R-Fed	$1,254	$56,709	$870	$19,611	$83,869	$0
	R-ST	$706	$56,654	$881	$23,294	$72,043	$0
	R-3	$938	$51,304	$463	$17,568	$76,003	$0
	C-Fed	$42,495	$50,046	$983	$31,174	$84,010	$0
	C-ST	$13,940	$59,314	$6,935	$26,730	$83,601	$0
	C-3	$1,661	$62,344	$520	$21,508	$92,250	$0
IS-Crud	**N**	$2,507	$73,868	$0	$25,458	$109,346	$0
	R-Fed	$0	$53,079	$0	$17,693	$78,983	$0
	R-ST	$0	$77,687	$0	$31,057	$130,944	$0
	R-3	$0	$58,853	$0	$19,618	$87,575	$0
	C-Fed	$250,398	$223,362	$172,866	$215,542	$294,249	$136,835
	C-ST	$145,141	$163,506	$194,847	$167,831	$218,099	$117,564
	C-3	$101,019	$143,450	$194,388	$146,285	$239,783	$52,788
S1-Bunk	**N**	$41	$41	$41	$41	$41	$41
	R-Fed	$41	$41	$41	$41	$41	$41
	R-ST	$41	$41	$41	$41	$41	$41
	R-3	$41	$41	$41	$41	$41	$41
	R-ISB	$41	$41	$41	$41	$41	$41
S1-Dies	**N**	$633,422	$279,652	$401,599	$438,224	$797,637	$80,963
	R-Fed	$153,413	$503,484	$416,803	$357,900	$722,534	$15,574
	R-ST	$283,090	$448,582	$669,492	$532,309	$945,871	$118,747
	R-3	$149,614	$522,775	$400,140	$357,510	$737,905	$10,987
S2-Crud	**N**	$2	$27	$81,019	$27,016	$120,553	$0
	R-Fed	$0	$7,525	$90,146	$32,557	$132,590	$0
	R-ST	$0	$30,965	$147,349	$44,040	$152,994	$0
	R-3	$0	$9,105	$58,708	$22,604	$85,802	$0
	R-ISB	$0	$4	$61,622	$20,542	$91,695	$0
	C-Fed	$329,232	$75,980	$82,163	$162,458	$451,384	$0
	C-ST	$318,111	$71,375	$83,577	$157,687	$435,817	$0
	C-3	$233,691	$74,481	$86,877	$131,683	$308,801	$0
OC-Crud	**N**	$16	$21	$20	$19	$29	$11
	R-Fed	$13	$21	$20	$18	$40	$2
	R-ST	$13	$21	$20	$18	$41	$1
	R-3	$16	$21	$20	$19	$32	$8
	R-ISB	$14	$21	$20	$18	$38	$3
	C-Fed	$13	$15	$18	$15	$27	$4
	C-ST	$13	$15	$18	$15	$30	$2
	C-3	$13	$16	$19	$16	$31	$3
C1-Bunk	**N**	$28	$0	$0	$9	$41	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$8	$0	$0	$1	$19	$0
	R-3	$0	$0	$0	$0	$0	$0
C2-Bunk	**N**	$21,778	$21,778	$21,778	$21,778	$21,778	$21,778
	R-Fed	$21,778	$21,778	$21,778	$21,778	$21,778	$21,778
	R-ST	$21,778	$21,778	$21,778	$21,778	$21,778	$21,778
	R-3	$21,778	$21,778	$21,778	$21,778	$21,778	$21,778

Subsistence Fishing

Fishing impacts include those on vulnerable populations, primarily Tribal Nations, who depend on subsistence fishing for vital protein intake. Tribal population census figures are in Table 37. Annual fish harvest and estimated subsistence fish consumption are in Tables 38 – 39. Assuming an annual intake of 55 grams per day, the number of days of subsistence fish loss are in Table 40 and the pounds of fish lost due to fishing bans are in Table 41 (percent losses are in Table 42). The impact of protein loss on Tribal children under two who could suffer life-long impacts on IQ and earning power are in Table 43.

Table 37: Washington Coastal Tribal Nation Populations[1]

Tribe	Total Population	Children under 2 yrs.	Children 2 – 18 yrs.
Hoh	102	14[2]	52[2]
Lower Elwha	375	5	163
Lummi	4,193	93	1,183
Makah	1,356	61	433
Nisqually	591	12	199
Port Gamble	698	24	258
Quileute	364	18	108
Quinault	1,370	59	454
Shoalwater	70	5[2]	15[2]
Skokomish	704	16	211
Swinomish	2,664	41	479
Tulalip	9,246	255	2,397
TOTAL	**12,487**	**348**	**5,952**

[1]Source: US Census Data 2000. [2]Hoh and Shoalwater child data are for children under 5 years and 5 to 18 years.

Table 38: Estimated Annual Treaty Tribe Fishing Harvest

Fish Type	Annual Pounds Harvested
Manila and Littleneck Clams	750,000 lbs.
Geoduck Clams	2,200,000 lbs.
Oysters	1,100,000 lbs.
Crabs	5,200,000 lbs.
Shrimp	115,111 lbs.
Salmon	10,000,000 lbs.[1] (2,000,000 fish)

Source: Northwest Indian Fisheries *Commission Report from the Treaty Indian Tribes in Western Washington 2003.* [1]Estimated weight based on approximately 2 million fish reported caught.

Table 39: Fish Consumption Rates for Various Fisher Populations

Data Source	Recreational *(grams/day)*	Subsistence *(grams/day)*	Tribal Fishers *(grams/day)*	Tribal *(grams/day)*	Basis for Consumption Rate
US EPA	17.5[1]	142.4[1]	70 (mean)[2] 170 (95th)[2]	NA	Continuing Survey of Food Intake by Individuals (USDA/ARS 1998)
Harris and Harper (1997)	NA	NA	540 (fresh, dried, and smoked)	NA	Surveyed Confederated Tribes of Umatilla Indian Reservation
CRITFC (1994)	NA	NA	NA	59 (mean) 170 (95th) 390 (99th)	Surveyed Umatilla, Nez Pierce, Yakama, Warm Springs Tribes
Toy *et al.* (1996)	NA	NA	NA	53 (males) 34 (females)	Surveyed Tulalip Tribe
	NA	NA	NA	66 (males) 25 (females)	Surveyed Squaxin Island Tribe

Source: US EPA 2000. NA = not available. [1]Values revised in 3rd Edition of Volume 1 of US EPA 2000*a*. [2]Values from EPA's Exposure Factors Handbook (US EPA 1997)

Table 40: Subsistence Fishing Losses of Tribal Nations Lands by Oil Spill Scenarios							
Scenario	**Response**	**Days of Subsistence Food Supply Killed Directly by Impacts of Oil Spill**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	14.8	15.3	9.5	13.2	30.9	1.3
	R-Fed	1.1	10.7	3.0	4.9	17.6	0.0
	R-ST	0.9	10.3	1.8	5.2	14.2	0.0
	R-3	1.0	9.6	1.4	4.0	14.2	0.0
	C-Fed	7.9	9.5	2.9	6.8	17.4	0.0
	C-ST	3.1	10.9	2.8	5.6	15.9	0.0
	C-3	1.1	11.4	1.4	4.6	16.8	0.0
IS-Crud	**N**	4.2	17.2	10.9	10.8	34.7	0.0
	R-Fed	0.0	10.0	0.7	3.5	15.8	0.0
	R-ST	0.0	14.3	0.5	6.1	25.0	0.0
	R-3	0.0	11.0	0.3	3.7	16.7	0.0
	C-Fed	45.2	40.4	31.9	39.2	53.9	24.9
	C-ST	26.4	29.7	35.5	30.5	39.7	21.5
	C-3	18.5	26.1	35.3	26.6	43.5	9.9
S1-Bunk	**N**	0.2	0.2	0.3	0.3	0.4	0.1
	R-Fed	0.0	0.0	0.1	0.0	0.1	0.0
	R-ST	0.0	0.0	0.2	0.2	0.7	0.0
	R-3	0.0	0.0	0.1	0.0	0.1	0.0
	R-ISB	0.0	0.0	0.0	0.0	0.0	0.0
S1-Dies	**N**	81.8	39.1	55.1	58.7	103.0	15.3
	R-Fed	24.0	65.7	56.6	48.8	93.6	7.3
	R-ST	44.7	65.0	93.4	75.5	126.8	24.5
	R-3	23.5	68.1	54.6	48.7	95.5	6.7
S2-Crud	**N**	3.7	2.3	11.1	5.7	18.4	0.3
	R-Fed	0.6	1.6	12.0	4.7	17.3	0.3
	R-ST	0.6	4.2	18.2	5.8	18.8	0.3
	R-3	0.6	1.7	8.4	3.6	12.0	0.4
	R-ISB	0.6	0.7	8.7	3.3	12.6	0.3
	C-Fed	38.4	9.4	11.1	19.6	53.8	0.1
	C-ST	37.1	8.9	11.2	19.0	51.9	0.2
	C-3	27.4	9.2	11.6	16.1	37.4	0.5
OC-Crud	**N**	0.0	0.0	0.8	0.1	0.5	0.0
	R-Fed	0.0	0.0	0.0	0.0	0.0	0.0
	R-ST	0.0	0.0	0.0	0.0	0.0	0.0
	R-3	0.0	0.0	0.0	0.0	0.0	0.0
	R-ISB	0.0	0.0	0.0	0.0	0.0	0.0
	C-Fed	0.0	0.0	0.0	0.0	0.0	0.0
	C-ST	0.0	0.0	0.0	0.0	0.0	0.0
	C-3	0.0	0.0	0.0	0.0	0.0	0.0
C1-Bunk	**N**	0.1	0.1	0.1	0.1	0.1	0.1
	R-Fed	0.0	0.0	0.0	0.0	0.1	0.0
	R-ST	0.0	0.0	0.0	0.0	0.0	0.0
	R-3	0.0	0.0	0.0	0.0	0.0	0.0
C2-Bunk	**N**	2.4	2.4	2.4	2.4	2.4	2.4
	R-Fed	2.4	2.4	2.4	2.4	2.4	2.4
	R-ST	2.4	2.4	2.4	2.4	2.4	2.4
	R-3	2.4	2.4	2.4	2.4	2.4	2.4
Assumes each coastal Tribal member eats 55 grams of subsistence fish per day, or all Tribal members eat 687 kg per day total.							

Table 41: Subsistence Fishing Losses of Tribal Nations Lands by Oil Spill Scenarios							
Scenario	**Response**	**Pounds Subsistence Fishing Loss Due to Fishing Ban[1]**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	138,267	63,905	54,029	85,400	45,895	177,772
	R-Fed	12,781	15,105	27,886	18,591	8,133	34,857
	R-ST	6,971	13,362	24,400	15,105	8,714	32,533
	R-3	12,200	13,362	29,048	18,591	37,181	0
	C-Fed	7,552	23,238	40,667	23,819	16,848	57,514
	C-ST	5,229	12,781	26,143	14,524	10,457	36,019
	C-3	138,267	63,905	54,029	85,400	45,895	177,772
IS-Crud	**N**	103,991	61,000	232,962	132,457	89,467	311,391
	R-Fed	12,200	29,048	47,638	40,667	9,876	60,419
	R-ST	1,743	28,467	38,343	30,791	6,971	44,733
	R-3	19,171	31,371	30,210	26,724	6,390	40,086
	C-Fed	34,276	24,981	44,152	34,276	9,295	53,448
	C-ST	20,333	24,400	33,695	26,143	6,971	40,086
	C-3	14,524	22,076	29,629	22,076	7,552	37,181
S1-Bunk	**N**	116,772	170,800	106,314	131,295	34,276	199,848
	R-Fed	52,286	16,848	65,067	44,733	24,981	94,695
	R-ST	56,933	16,848	84,819	52,867	34,276	121,419
	R-3	22,076	15,105	45,895	27,886	16,267	60,419
	R-ISB	52,867	24,400	29,629	35,438	15,105	65,648
S1-Dies	**N**	88,305	81,914	43,571	71,457	119,676	22,657
	R-Fed	47,638	29,629	23,238	33,695	59,257	8,133
	R-ST	41,248	33,695	44,733	40,086	51,124	28,467
	R-3	5,810	18,591	49,381	24,400	69,133	0
S2-Crud	**N**	291,058	97,019	84,819	158,019	115,610	389,239
	R-Fed	61,000	29,629	30,791	40,667	17,429	75,524
	R-ST	36,600	27,886	30,791	31,952	4,067	40,086
	R-3	17,429	28,467	30,210	25,562	6,971	39,505
	R-ISB	36,019	23,819	29,048	29,629	6,390	42,410
	C-Fed	49,381	24,400	30,791	34,857	12,781	61,000
	C-ST	16,267	21,495	32,533	23,238	8,133	40,086
	C-3	193,651	96,826	222,699	170,413	65,841	304,032
OC-Crud	**N**	346,635	540,287	1,584,066	823,017	666,160	2,155,337
	R-Fed	249,810	240,127	329,207	273,048	48,413	371,810
	R-ST	292,413	222,699	327,270	280,794	52,286	387,302
	R-3	247,873	228,508	311,778	263,366	44,540	350,509
	R-ISB	263,366	218,826	302,096	261,429	42,603	344,699
	C-Fed	226,572	211,080	335,016	257,556	67,778	393,112
	C-ST	232,381	230,445	331,143	265,302	56,159	379,556
	C-3	251,746	205,270	305,969	253,683	50,349	354,382
C1-Bunk	**N**	0	0	0	0	0	0
	R-Fed	0	0	0	0	0	0
	R-ST	0	0	0	0	0	0
	R-3	0	0	0	0	0	0
C2-Bunk	**N**	0	0	0	0	0	0
	R-Fed	0	0	0	0	0	0
	R-ST	0	0	0	0	0	0
	R-3	0	0	0	0	0	0
[1]Four-month fishing ban assumed.							

Table 42: Subsistence Fishing Losses of Tribal Nations Lands by Oil Spill Scenarios							
Scenario	**Response**	**% Subsistence Fishing Loss Due to Fishing Ban (food lost/food required)[1]**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	38.0%	17.6%	14.8%	23.5%	12.6%	48.9%
	R-Fed	3.5%	4.2%	7.7%	5.1%	2.2%	9.6%
	R-ST	1.9%	3.7%	6.7%	4.2%	2.4%	8.9%
	R-3	3.4%	3.7%	8.0%	5.1%	10.2%	0.0%
	C-Fed	2.1%	6.4%	11.2%	6.5%	4.6%	15.8%
	C-ST	1.4%	3.5%	7.2%	4.0%	2.9%	9.9%
	C-3	38.0%	17.6%	14.8%	23.5%	12.6%	48.9%
IS-Crud	**N**	28.6%	16.8%	64.0%	36.4%	24.6%	85.6%
	R-Fed	3.4%	8.0%	13.1%	11.2%	2.7%	16.6%
	R-ST	0.5%	7.8%	10.5%	8.5%	1.9%	12.3%
	R-3	5.3%	8.6%	8.3%	7.3%	1.8%	11.0%
	C-Fed	9.4%	6.9%	12.1%	9.4%	2.6%	14.7%
	C-ST	5.6%	6.7%	9.3%	7.2%	1.9%	11.0%
	C-3	4.0%	6.1%	8.1%	6.1%	2.1%	10.2%
S1-Bunk	**N**	32.1%	46.9%	29.2%	36.1%	9.4%	54.9%
	R-Fed	14.4%	4.6%	17.9%	12.3%	6.9%	26.0%
	R-ST	15.6%	4.6%	23.3%	14.5%	9.4%	33.4%
	R-3	6.1%	4.2%	12.6%	7.7%	4.5%	16.6%
	R-ISB	14.5%	6.7%	8.1%	9.7%	4.2%	18.0%
S1-Dies	**N**	24.3%	22.5%	12.0%	19.6%	32.9%	6.2%
	R-Fed	13.1%	8.1%	6.4%	9.3%	16.3%	2.2%
	R-ST	11.3%	9.3%	12.3%	11.0%	14.1%	7.8%
	R-3	1.6%	5.1%	13.6%	6.7%	19.0%	0.0%
S2-Crud	**N**	80.0%	26.7%	23.3%	43.4%	31.8%	107.0%
	R-Fed	16.8%	8.1%	8.5%	11.2%	4.8%	20.8%
	R-ST	10.1%	7.7%	8.5%	8.8%	1.1%	11.0%
	R-3	4.8%	7.8%	8.3%	7.0%	1.9%	10.9%
	R-ISB	9.9%	6.5%	8.0%	8.1%	1.8%	11.7%
	C-Fed	13.6%	6.7%	8.5%	9.6%	3.5%	16.8%
	C-ST	4.5%	5.9%	8.9%	6.4%	2.2%	11.0%
	C-3	53.2%	26.6%	61.2%	46.8%	18.1%	83.6%
OC-Crud	**N**	95.3%	148.5%	435.4%	226.2%	183.1%	592.4%
	R-Fed	68.7%	66.0%	90.5%	75.0%	13.3%	102.2%
	R-ST	80.4%	61.2%	89.9%	77.2%	14.4%	106.4%
	R-3	68.1%	62.8%	85.7%	72.4%	12.2%	96.3%
	R-ISB	72.4%	60.1%	83.0%	71.8%	11.7%	94.7%
	C-Fed	62.3%	58.0%	92.1%	70.8%	18.6%	108.0%
	C-ST	63.9%	63.3%	91.0%	72.9%	15.4%	104.3%
	C-3	69.2%	56.4%	84.1%	69.7%	13.8%	97.4%
C1-Bunk	**N**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	R-Fed	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	R-ST	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	R-3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
C2-Bunk	**N**	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	R-Fed	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	R-ST	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	R-3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
[1]Assumes four-month ban on fishing and shellfishing and that Tribal populations entitled to 50% catch.							

Table 43: Impact of Subsistence Fishing Losses of Tribal Nations Lands by Oil Spill Scenarios							
Scenario	**Response**	**Lost Earning Power Due to IQ Reduction of Tribal Children Under 2**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$3,594,329	$1,669,494	$1,403,892	$2,229,154	$1,195,206	$4,638,537
	R-Fed	$332,002	$398,402	$730,404	$483,774	$208,687	$910,633
	R-ST	$180,229	$350,973	$635,546	$398,402	$227,658	$844,233
	R-3	$322,516	$350,973	$758,861	$483,774	$967,548	$0
	C-Fed	$199,201	$607,089	$1,062,405	$616,574	$436,345	$1,498,750
	C-ST	$132,801	$332,002	$682,975	$379,430	$275,087	$939,090
	C-3	$3,604,589	$1,669,494	$1,403,892	$2,229,154	$1,195,206	$4,638,537
IS-Crud	**N**	$2,712,927	$1,593,608	$6,070,886	$3,452,817	$2,333,497	$8,119,811
	R-Fed	$322,516	$758,861	$1,242,635	$1,062,405	$256,116	$1,574,636
	R-ST	$47,429	$739,889	$996,005	$806,290	$180,229	$1,166,748
	R-3	$502,745	$815,775	$787,318	$692,460	$170,744	$1,043,434
	C-Fed	$891,661	$654,517	$1,147,777	$891,661	$246,630	$1,394,407
	C-ST	$531,203	$635,546	$882,176	$682,975	$180,229	$1,043,434
	C-3	$379,430	$578,631	$768,347	$578,631	$199,201	$967,548
S1-Bunk	**N**	$3,044,929	$4,448,821	$2,769,842	$3,424,359	$891,661	$5,207,682
	R-Fed	$1,365,949	$436,345	$1,697,951	$1,166,748	$654,517	$2,466,298
	R-ST	$1,479,779	$436,345	$2,210,182	$1,375,435	$891,661	$3,168,244
	R-3	$578,631	$398,402	$1,195,206	$730,404	$426,859	$1,574,636
	R-ISB	$1,375,435	$635,546	$768,347	$920,119	$398,402	$1,707,437
S1-Dies	**N**	$2,305,040	$2,134,296	$1,138,291	$1,859,209	$3,120,815	$588,117
	R-Fed	$1,242,635	$768,347	$607,089	$882,176	$1,546,179	$208,687
	R-ST	$1,071,891	$882,176	$1,166,748	$1,043,434	$1,337,492	$739,889
	R-3	$151,772	$483,774	$1,290,063	$635,546	$1,802,294	$0
S2-Crud	**N**	$7,588,608	$2,532,698	$2,210,182	$4,116,820	$3,016,472	$10,149,763
	R-Fed	$1,593,608	$768,347	$806,290	$1,062,405	$455,316	$1,973,038
	R-ST	$958,062	$730,404	$806,290	$834,747	$104,343	$1,043,434
	R-3	$455,316	$739,889	$787,318	$664,003	$180,229	$1,033,948
	R-ISB	$939,090	$616,574	$758,861	$768,347	$170,744	$1,109,834
	C-Fed	$1,290,063	$635,546	$806,290	$910,633	$332,002	$1,593,608
	C-ST	$426,859	$559,660	$844,233	$607,089	$208,687	$1,043,434
	C-3	$5,046,424	$2,523,212	$5,805,285	$4,439,336	$1,716,923	$7,930,095
OC-Crud	**N**	$9,039,929	$14,086,354	$41,300,999	$21,456,789	$17,368,427	$56,193,642
	R-Fed	$6,516,717	$6,260,602	$8,584,613	$7,114,320	$1,261,606	$9,694,447
	R-ST	$7,626,551	$5,805,285	$8,527,698	$7,323,007	$1,365,949	$10,092,849
	R-3	$6,459,803	$5,957,057	$8,129,296	$6,867,690	$1,157,263	$9,134,787
	R-ISB	$6,867,690	$5,700,942	$7,873,181	$6,810,776	$1,109,834	$8,983,015
	C-Fed	$5,909,628	$5,501,741	$8,736,385	$6,715,918	$1,764,351	$10,244,621
	C-ST	$6,061,401	$6,004,486	$8,632,042	$6,915,119	$1,460,807	$9,893,648
	C-3	$6,564,146	$5,349,969	$7,977,524	$6,611,575	$1,309,035	$9,239,130
C1-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
C2-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0

Assumes loss of 4 IQ pts from 50% 4-month protein reduction; $723,000 lifetime earnings per child with 2% reduction earning power per IQ pt (Gross, *et al*. 2002; Schűrch 1995; Wachs 1995; VanDuzen *et al.* 1969; Pollitt 2000).

Parks and Recreation

Impacts on state and national parks and recreation areas were considered from the perspective of "lost use" and lost income from these activities. National park areas included are shown in Figure 10, with their corresponding visitor days and income in Table 44. The analogous information for state parks is shown in Figure 11 and Table 45.

Impacts were considered by percentage of area impacted by 1 gram/m^r of shoreline oil. Results are shown in Tables 46 – 51. Lost-use values were based on federal standards (US Army Corps of Engineers 2001).

Figure 11: National Park Areas

Table 44: Coastal National Parks Visits and Spending				
National Park	**Visitor Days**		**Spending**	
	Annual	**Daily**	**Annual**	**Daily**
Fort Vancouver NHS	42,756	117	$17,700,000	$48,493
Olympic NP	1,620,628	4,440	$91,600,000	$250,959
San Juan Islands NHP	18,464	51	$17,100,000	$46,849
Fort Clatsop NM	31,826	87	$6,900,000	$18,904
Pacific Rim NP (Canada)	800,000	2,192	$16,000,000	$43,836
Total	**2,513,674**	**6,887**	**$149,300,000**	**$409,041**
Sources: National Parks Service, Parks Canada				

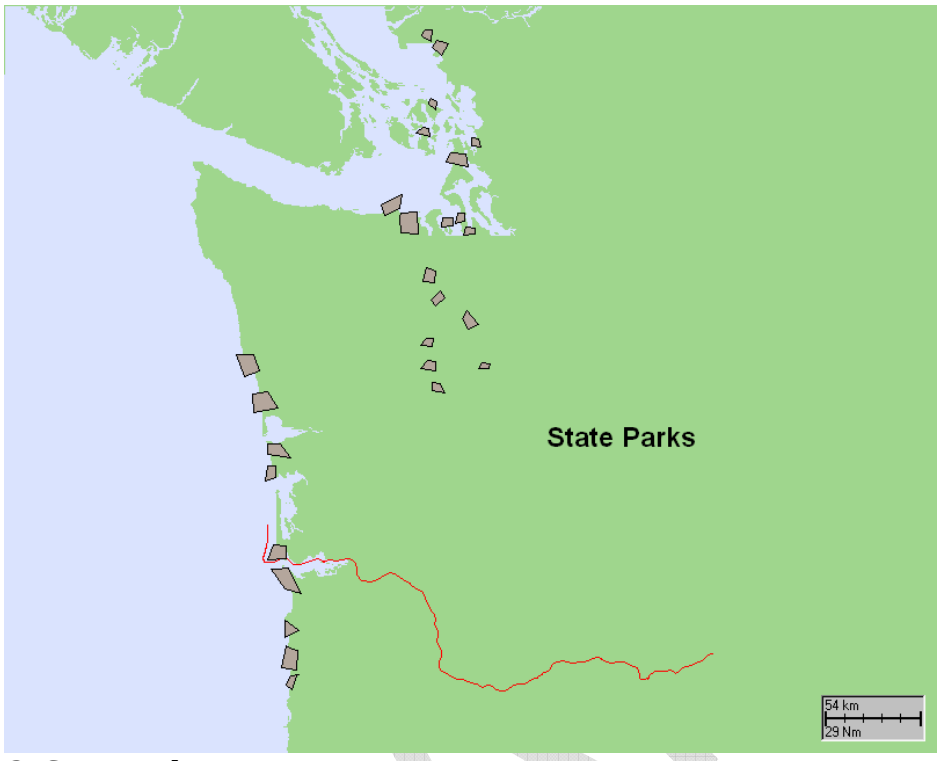


Figure 12: State Parks

Table 45: Coastal State Park Visits, Spending and Earnings						
County	**Visitor Days**		**Visitor Spending**		**Earnings**	
Washington	**Annual**	**Daily**	**Annual**	**Daily**	**Annual**	**Daily**
Clallam	518,923	1,422	$6,400,000	$17,534	$1,200,000	$3,288
Clark	140,195	384	$11,200,000	$30,685	$1,700,000	$4,658
Cowlitz	449,152	1,231	$8,800,000	$24,110	$1,300,000	$3,562
Douglas	242,347	664	$64,800,000	$177,534	$14,300,000	$39,178
Grays Harbor	6,518,830	17,860	$45,600,000	$124,932	$11,100,000	$30,411
Island	4,586,870	12,567	$26,300,000	$72,055	$6,000,000	$16,438
Jefferson	2,718,102	7,447	$70,600,000	$193,425	$12,100,000	$33,151
King	4,022,701	11,021	$20,200,000	$55,342	$4,300,000	$11,781
Kitsap	1,639,523	4,492	$8,100,000	$22,192	$1,700,000	$4,658
Mason	1,791,820	4,909	$18,800,000	$51,507	$4,100,000	$11,233
Pacific	4,782,443	13,103	$45,300,000	$124,110	$10,100,000	$27,671
Pierce	913,929	2,504	$20,600,000	$56,438	$3,300,000	$9,041
San Juan	1,242,993	3,405	$13,400,000	$36,712	$300,000	$822
Skagit	537,660	1,473	$8,300,000	$22,740	$1,500,000	$4,110
Skamania	419,804	1,150	$4,100,000	$11,233	$900,000	$2,466
Snohomish	2,287,921	6,268	$33,900,000	$92,877	$6,100,000	$16,712
Thurston	649,846	1,780	$10,600,000	$29,041	$1,900,000	$5,205
Whatcom	2,916,092	7,989	$32,600,000	$89,315	$6,800,000	$18,630
Washington TOTAL	**36,379,151**	**99,669**	**$449,600,000**	**$1,231,781**	**$88,700,000**	**$243,014**
Columbia River Gorge	3,801,013	10,414	$45,612,156	$124,965	$9,122,431	$24,993
North Coast	3,245,077	8,891	$38,940,924	$106,687	$7,788,185	$21,337
Oregon TOTAL	**7,046,090**	**19,304**	**84,553,080**	**231,652**	**16,910,616**	**46,330**
TOTAL	**43,425,241**	**118,973**	**$534,153,080**	**$1,463,433**	**$105,610,616**	**$289,344**
Sources: Washington State Parks and Recreation Commission; Oregon State Park Commission						

Table 46: Areas of State Parks Impacted Oil Spill Scenarios							
Scenario	**Response**	**% Area Covered by Oil (> 0.01 g/m^2)**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	2.95%	1.38%	3.16%	2.50%	4.44%	0.55%
	R-Fed	0.01%	0.33%	0.90%	0.42%	1.32%	0.00%
	R-ST	0.00%	0.29%	1.02%	0.44%	1.49%	0.00%
	R-3	0.01%	0.20%	0.78%	0.33%	1.14%	0.00%
	C-Fed	0.00%	0.21%	0.77%	0.33%	1.12%	0.00%
	C-ST	0.00%	0.29%	0.80%	0.36%	1.17%	0.00%
	C-3	0.00%	0.21%	0.77%	0.33%	1.12%	0.00%
IS-Crud	**N**	0.00%	1.79%	4.91%	2.23%	7.21%	0.00%
	R-Fed	1.33%	0.00%	0.37%	0.12%	0.55%	0.00%
	R-ST	0.76%	0.16%	0.56%	0.24%	0.81%	0.00%
	R-3	0.00%	0.47%	0.36%	0.27%	0.76%	0.00%
	C-Fed	0.00%	0.08%	0.43%	0.17%	0.62%	0.00%
	C-ST	0.00%	0.04%	0.31%	0.12%	0.45%	0.00%
	C-3	0.00%	0.01%	0.33%	0.12%	0.49%	0.00%
S1-Bunk	**N**	0.53%	0.00%	0.82%	1.29%	0.00%	0.53%
	R-Fed	0.00%	0.00%	0.33%	0.50%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.29%	0.43%	0.00%	0.00%
	R-3	0.00%	0.00%	0.27%	0.40%	0.00%	0.00%
	R-ISB	0.00%	0.00%	0.22%	0.33%	0.00%	0.00%
S1-Dies	**N**	0.00%	1.49%	0.00%	0.50%	2.21%	0.00%
	R-Fed	0.00%	0.57%	0.00%	0.19%	0.85%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.36%	0.00%	0.12%	0.53%	0.00%
S2-Crud	**N**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ISB	1.81%	0.85%	1.94%	1.53%	2.73%	0.34%
	C-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-ST	0.16%	0.20%	0.00%	0.12%	0.32%	0.00%
	C-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
OC-Crud	**N**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ISB	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
C1-Bunk	**N**	0.00%	0.01%	1.83%	0.92%	3.48%	0.00%
	R-Fed	3.49%	0.00%	0.60%	1.36%	5.10%	0.00%
	R-ST	3.49%	0.00%	0.54%	1.34%	5.10%	0.00%
	R-3	3.49%	0.00%	0.33%	1.27%	5.13%	0.00%
C2-Bunk	**N**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Table 47: Impact on State Parks Impacted Oil Spill Scenarios							
Scenario	**Response**	**Lost Use for Duration of Spill Response and Oiled Areas**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$1,368,784	$640,313	$1,466,223	$1,159,987	$2,060,136	$255,197
	R-Fed	$4,640	$153,118	$417,595	$194,878	$612,473	$0
	R-ST	$0	$134,558	$473,275	$204,158	$691,352	$0
	R-3	$4,640	$92,799	$361,916	$153,118	$528,954	$0
	C-Fed	$0	$97,439	$357,276	$153,118	$519,674	$0
	C-ST	$0	$134,558	$371,196	$167,038	$542,874	$0
	C-3	$0	$97,439	$357,276	$153,118	$519,674	$0
IS-Crud	**N**	$0	$830,551	$2,278,214	$1,034,708	$3,345,402	$0
	R-Fed	$617,113	$0	$171,678	$55,679	$255,197	$0
	R-ST	$352,636	$74,239	$259,837	$111,359	$375,836	$0
	R-3	$0	$218,078	$167,038	$125,279	$352,636	$0
	C-Fed	$0	$37,120	$199,518	$78,879	$287,677	$0
	C-ST	$0	$18,560	$143,838	$55,679	$208,798	$0
	C-3	$0	$4,640	$153,118	$55,679	$227,357	$0
S1-Bunk	**N**	$368,876	$0	$570,713	$897,830	$0	$368,876
	R-Fed	$0	$0	$229,677	$347,996	$0	$0
	R-ST	$0	$0	$201,838	$299,277	$0	$0
	R-3	$0	$0	$187,918	$278,397	$0	$0
	R-ISB	$0	$0	$153,118	$229,677	$0	$0
S1-Dies	**N**	$0	$345,676	$0	$115,999	$512,714	$0
	R-Fed	$0	$132,238	$0	$44,079	$197,198	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$83,519	$0	$27,840	$122,959	$0
S2-Crud	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
	R-ISB	$839,830	$394,395	$900,150	$709,912	$1,266,706	$157,758
	C-Fed	$0	$0	$0	$0	$0	$0
	C-ST	$74,239	$92,799	$0	$55,679	$148,478	$0
	C-3	$0	$0	$0	$0	$0	$0
OC-Crud	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
	R-ISB	$0	$0	$0	$0	$0	$0
	C-Fed	$0	$0	$0	$0	$0	$0
	C-ST	$0	$0	$0	$0	$0	$0
	C-3	$0	$0	$0	$0	$0	$0
C1-Bunk	**N**	$0	$6,960	$1,273,665	$640,313	$2,422,052	$0
	R-Fed	$2,429,012	$0	$417,595	$946,549	$3,549,559	$0
	R-ST	$2,429,012	$0	$375,836	$932,629	$3,549,559	$0
	R-3	$2,429,012	$0	$229,677	$883,910	$3,570,439	$0
C2-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
Lost-use values based on US Army Corps of Engineers - $6.50 per person-day.							

Table 48: Impact on State Parks Impacted Oil Spill Scenarios							
Scenario	**Response**	**Lost Income for Duration of Spill Response and Oiled Areas**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$512,139	$239,577	$548,596	$434,016	$770,812	$95,484
	R-Fed	$1,736	$57,290	$156,246	$72,915	$229,160	$0
	R-ST	$0	$50,346	$177,079	$76,387	$258,674	$0
	R-3	$1,736	$34,721	$135,413	$57,290	$197,911	$0
	C-Fed	$0	$36,457	$133,677	$57,290	$194,439	$0
	C-ST	$0	$50,346	$138,885	$62,498	$203,119	$0
	C-3	$0	$36,457	$133,677	$57,290	$194,439	$0
IS-Crud	**N**	$0	$310,755	$852,407	$387,142	$1,251,702	$0
	R-Fed	$230,897	$0	$64,234	$20,833	$95,484	$0
	R-ST	$131,941	$27,777	$97,220	$41,666	$140,621	$0
	R-3	$0	$81,595	$62,498	$46,874	$131,941	$0
	C-Fed	$0	$13,889	$74,651	$29,513	$107,636	$0
	C-ST	$0	$6,944	$53,818	$20,833	$78,123	$0
	C-3	$0	$1,736	$57,290	$20,833	$85,067	$0
S1-Bunk	**N**	$138,017	$0	$213,536	$335,928	$0	$138,017
	R-Fed	$0	$0	$85,935	$130,205	$0	$0
	R-ST	$0	$0	$75,519	$111,976	$0	$0
	R-3	$0	$0	$70,311	$104,164	$0	$0
	R-ISB	$0	$0	$57,290	$85,935	$0	$0
S1-Dies	**N**	$0	$129,337	$0	$43,402	$191,835	$0
	R-Fed	$0	$49,478	$0	$16,493	$73,783	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$31,249	$0	$10,416	$46,006	$0
S2-Crud	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
	R-ISB	$314,228	$147,565	$336,796	$265,618	$473,945	$59,026
	C-Fed	$0	$0	$0	$0	$0	$0
	C-ST	$27,777	$34,721	$0	$20,833	$55,554	$0
	C-3	$0	$0	$0	$0	$0	$0
OC-Crud	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
	R-ISB	$0	$0	$0	$0	$0	$0
	C-Fed	$0	$0	$0	$0	$0	$0
	C-ST	$0	$0	$0	$0	$0	$0
	C-3	$0	$0	$0	$0	$0	$0
C1-Bunk	**N**	$0	$2,604	$476,550	$239,577	$906,225	$0
	R-Fed	$908,830	$0	$156,246	$354,157	$1,328,089	$0
	R-ST	$908,830	$0	$140,621	$348,949	$1,328,089	$0
	R-3	$908,830	$0	$85,935	$330,720	$1,335,901	$0
C2-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
Parks income assumed to be $5 per person-day.							

Table 49: Areas of National Parks Impacted Oil Spill Scenarios							
Scenario	**Response**	**% Area Covered by Oil (> 0.01 g/m^2)**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	1.41%	0.00%	0.00%	0.47%	2.10%	0.81%
	R-Fed	0.24%	0.00%	0.00%	0.08%	0.36%	0.14%
	R-ST	0.01%	0.00%	0.00%	0.00%	0.02%	0.01%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
IS-Crud	**N**	0.71%	0.14%	0.42%	0.43%	0.99%	0.28%
	R-Fed	0.00%	0.12%	0.19%	0.12%	0.27%	0.08%
	R-ST	0.00%	0.26%	0.10%	0.13%	0.36%	0.12%
	R-3	0.00%	0.23%	0.04%	0.09%	0.34%	0.12%
	C-Fed	0.00%	0.18%	0.20%	0.13%	0.34%	0.11%
	C-ST	0.03%	0.08%	0.02%	0.05%	0.11%	0.03%
	C-3	0.00%	0.02%	0.04%	0.02%	0.06%	0.02%
S1-Bunk	**N**	0.64%	2.06%	0.56%	1.08%	2.77%	0.84%
	R-Fed	0.00%	0.70%	0.00%	0.23%	1.05%	0.41%
	R-ST	0.00%	0.69%	0.00%	0.23%	1.02%	0.40%
	R-3	0.00%	0.36%	0.00%	0.12%	0.54%	0.21%
	R-ISB	0.00%	0.88%	0.00%	0.29%	1.32%	0.51%
S1-Dies	**N**	0.20%	2.60%	1.80%	1.50%	4.00%	1.20%
	R-Fed	0.00%	0.00%	1.80%	0.60%	2.70%	1.00%
	R-ST	0.20%	0.00%	1.90%	0.70%	2.80%	1.00%
	R-3	0.00%	0.00%	2.10%	0.70%	3.10%	1.20%
S2-Crud	**N**	0.11%	1.39%	0.00%	0.50%	2.05%	0.77%
	R-Fed	0.32%	1.42%	0.00%	0.58%	2.08%	0.75%
	R-ST	0.01%	1.51%	0.00%	0.50%	2.24%	0.87%
	R-3	0.00%	1.14%	0.00%	0.38%	1.69%	0.66%
	R-ISB	0.00%	1.42%	0.00%	0.47%	2.12%	0.82%
	C-Fed	0.00%	1.07%	0.00%	0.36%	1.60%	0.62%
	C-ST	0.00%	1.24%	0.00%	0.41%	1.84%	0.71%
	C-3	0.21%	0.00%	0.30%	0.17%	0.48%	0.16%
OC-Crud	**N**	3.65%	0.00%	8.67%	4.11%	12.81%	4.35%
	R-Fed	0.00%	1.80%	1.70%	1.17%	3.19%	1.01%
	R-ST	0.00%	1.44%	1.50%	0.98%	2.68%	0.85%
	R-3	0.00%	2.08%	1.63%	1.24%	3.43%	1.10%
	R-ISB	0.00%	1.77%	1.44%	1.07%	2.95%	0.94%
	C-Fed	0.00%	2.03%	1.49%	1.17%	3.27%	1.05%
	C-ST	0.00%	2.06%	1.62%	1.23%	3.40%	1.09%
	C-3	0.00%	1.67%	1.55%	1.07%	2.94%	0.93%
C1-Bunk	**N**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
C2-Bunk	**N**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Table 50: Impact on National Parks Impacted Oil Spill Scenarios							
Scenario	**Response**	**Lost Use for Duration of Spill Response and Oiled Areas**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$37,872	$0	$0	$12,624	$56,405	$21,756
	R-Fed	$6,446	$0	$0	$2,149	$9,669	$3,760
	R-ST	$269	$0	$0	$0	$537	$269
	R-3	$0	$0	$0	$0	$0	$0
	C-Fed	$0	$0	$0	$0	$0	$0
	C-ST	$0	$0	$0	$0	$0	$0
	C-3	$0	$0	$0	$0	$0	$0
IS-Crud	**N**	$19,070	$3,760	$11,281	$11,549	$26,591	$7,521
	R-Fed	$0	$3,223	$5,103	$3,223	$7,252	$2,149
	R-ST	$0	$6,983	$2,686	$3,492	$9,669	$3,223
	R-3	$0	$6,178	$1,074	$2,417	$9,132	$3,223
	C-Fed	$0	$4,835	$5,372	$3,492	$9,132	$2,955
	C-ST	$806	$2,149	$537	$1,343	$2,955	$806
	C-3	$0	$537	$1,074	$537	$1,612	$537
S1-Bunk	**N**	$25,785	$82,995	$22,562	$43,512	$111,600	$33,843
	R-Fed	$0	$28,202	$0	$9,266	$42,303	$16,518
	R-ST	$0	$27,799	$0	$9,266	$41,095	$16,116
	R-3	$0	$14,504	$0	$4,835	$21,756	$8,461
	R-ISB	$0	$35,454	$0	$11,684	$53,181	$20,547
S1-Dies	**N**	$2,686	$34,917	$24,173	$20,144	$53,719	$16,116
	R-Fed	$0	$0	$24,173	$8,058	$36,260	$13,430
	R-ST	$2,686	$0	$25,516	$9,401	$37,603	$13,430
	R-3	$0	$0	$28,202	$9,401	$41,632	$16,116
S2-Crud	**N**	$2,955	$37,334	$0	$13,430	$55,062	$20,682
	R-Fed	$8,595	$38,140	$0	$15,578	$55,867	$20,144
	R-ST	$269	$40,558	$0	$13,430	$60,165	$23,368
	R-3	$0	$30,620	$0	$10,207	$45,392	$17,727
	R-ISB	$0	$38,140	$0	$12,624	$56,942	$22,025
	C-Fed	$0	$28,739	$0	$9,669	$42,975	$16,653
	C-ST	$0	$33,306	$0	$11,012	$49,421	$19,070
	C-3	$5,640	$0	$8,058	$4,566	$12,892	$4,297
OC-Crud	**N**	$98,036	$0	$232,870	$110,392	$344,068	$116,838
	R-Fed	$0	$48,347	$45,661	$31,425	$85,681	$27,128
	R-ST	$0	$38,677	$40,289	$26,322	$71,983	$22,830
	R-3	$0	$55,867	$43,781	$33,306	$92,127	$29,545
	R-ISB	$0	$47,541	$38,677	$28,739	$79,235	$25,248
	C-Fed	$0	$54,524	$40,020	$31,425	$87,830	$28,202
	C-ST	$0	$55,330	$43,512	$33,037	$91,322	$29,277
	C-3	$0	$44,855	$41,632	$28,739	$78,966	$24,979
C1-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
C2-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
Lost-use values based on US Army Corps of Engineers - $6.50 per person-day. Assumes 2 months lost use for crude oil spills, 3 months for Bunker spills and 1 month for diesel spills.							

Table 51: Impact on National Parks Impacted Oil Spill Scenarios							
Scenario	**Response**	**Lost Income for Duration of Spill Response and Oiled Areas**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$311,072	$0	$0	$103,691	$463,298	$178,701
	R-Fed	$52,948	$0	$0	$17,649	$79,423	$30,887
	R-ST	$2,206	$0	$0	$0	$4,412	$2,206
	R-3	$0	$0	$0	$0	$0	$0
	C-Fed	$0	$0	$0	$0	$0	$0
	C-ST	$0	$0	$0	$0	$0	$0
	C-3	$0	$0	$0	$0	$0	$0
IS-Crud	**N**	$156,639	$30,887	$92,660	$94,866	$218,412	$61,773
	R-Fed	$0	$26,474	$41,917	$26,474	$59,567	$17,649
	R-ST	$0	$57,361	$22,062	$28,680	$79,423	$26,474
	R-3	$0	$50,742	$8,825	$19,856	$75,010	$26,474
	C-Fed	$0	$39,711	$44,124	$28,680	$75,010	$24,268
	C-ST	$6,619	$17,649	$4,412	$11,031	$24,268	$6,619
	C-3	$0	$4,412	$8,825	$4,412	$13,237	$4,412
S1-Bunk	**N**	$211,793	$681,710	$185,319	$357,401	$916,668	$277,979
	R-Fed	$0	$231,649	$0	$76,113	$347,474	$135,680
	R-ST	$0	$228,340	$0	$76,113	$337,546	$132,371
	R-3	$0	$119,134	$0	$39,711	$178,701	$69,495
	R-ISB	$0	$291,216	$0	$95,969	$436,824	$168,773
S1-Dies	**N**	$22,062	$286,804	$198,556	$165,464	$441,236	$132,371
	R-Fed	$0	$0	$198,556	$66,185	$297,835	$110,309
	R-ST	$22,062	$0	$209,587	$77,216	$308,865	$110,309
	R-3	$0	$0	$231,649	$77,216	$341,958	$132,371
S2-Crud	**N**	$24,268	$306,659	$0	$110,309	$452,267	$169,876
	R-Fed	$70,598	$313,278	$0	$127,959	$458,886	$165,464
	R-ST	$2,206	$333,133	$0	$110,309	$494,185	$191,938
	R-3	$0	$251,505	$0	$83,835	$372,845	$145,608
	R-ISB	$0	$313,278	$0	$103,691	$467,710	$180,907
	C-Fed	$0	$236,061	$0	$79,423	$352,989	$136,783
	C-ST	$0	$273,567	$0	$90,453	$405,937	$156,639
	C-3	$46,330	$0	$66,185	$37,505	$105,897	$35,299
OC-Crud	**N**	$805,256	$0	$1,912,759	$906,741	$2,826,119	$959,689
	R-Fed	$0	$397,113	$375,051	$258,123	$703,772	$222,824
	R-ST	$0	$317,690	$330,927	$216,206	$591,257	$187,525
	R-3	$0	$458,886	$359,608	$273,567	$756,720	$242,680
	R-ISB	$0	$390,494	$317,690	$236,061	$650,824	$207,381
	C-Fed	$0	$447,855	$328,721	$258,123	$721,421	$231,649
	C-ST	$0	$454,473	$357,401	$271,360	$750,102	$240,474
	C-3	$0	$368,432	$341,958	$236,061	$648,617	$205,175
C1-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
C2-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
Parks income assumed to be $59 per day based on Table 44.							

Recreational Boating

Recreational boating impacts were based on lost-use (using federal methods in US Army Corps of Engineers 2001) and percentage areas impacted. Boating areas are assumed to be as in Figure 8. It was assumed that there would be six days of boating prohibition for bunker and crude oil spills and two days for diesel spills. It was assumed that 20% of boatowners would want to engage in recreational boating activities during the time period of the oil spill response operations. Potential boating losses are shown in Table 52 based on the vessel registrations in Table 53.

Table 52: Total Small Vessels in Coastal Counties of Washington

Ports Area	County	TOTAL	Potential Lost-Use Per Day[1] (Total Impact)
Grays Harbor	**Grays Harbor***	7,606	$49,439
	Area TOTAL	**7,606**	**$49,439**
Portland	**Clark***	25,901	$168,357
	Cowlitz*	9,863	$64,110
	Klickitat*	1,551	$10,082
	Pacific*	2,984	$19,396
	Skamania*	993	$6,455
	Wahkaikum*	961	$6,247
	Area TOTAL	**42,253**	**$274,645**
Ports North	**San Juan***	5,231	$34,002
	Skagit*	15,656	$101,764
	Whatcom*	16,189	$105,229
	Area TOTAL	**37,076**	**$240,994**
Ports South	**Island***	10,304	$66,976
	Jefferson*	5,370	$34,905
	King*	102,388	$665,522
	Kitsap*	22,926	$149,019
	Mason*	9,440	$61,360
	Pierce*	51,255	$333,158
	Snohomish*	49,229	$319,989
	Thurston*	18,742	$121,823
	Area TOTAL	**269,654**	**$1,752,751**
Str Juan de Fuca South	**Clallam***	9,304	$60,476
	Area TOTAL	9,304	**$60,476**
TOTAL (All Coastal)		**365,893**	$2,378,305

Based on vessel registrations. [1]Based on US Army Corps of Engineers lost-use value of $6.50 per day.

The estimated costs of lost-use for recreational boating are shown in Table 54.

Table 53: Recreational Vessels in Washington State			
County (*Coastal)	**Registered**	**Not Registered**	**TOTAL**
Adams	723	489	1,212
Asotin	944	964	1,908
Benton	8,679	4,513	13,192
Chelan	4,742	2,595	7,337
Clallam*	5,183	4,121	9,304
Clark*	15,163	10,738	25,901
Columbia	283	187	470
Cowlitz*	6,023	3,840	9,863
Douglas	2,128	1,159	3,287
Ferry	408	360	768
Franklin	2,266	1,364	3,630
Garfield	178	157	335
Grant	4,783	2,663	7,446
Grays Harbor*	4,148	3,458	7,606
Island*	6,040	4,264	10,304
Jefferson*	3,104	2,266	5,370
King*	63,751	38,637	102,388
Kitsap*	13,368	9,558	22,926
Kittitas	1,545	912	2,457
Klickitat*	821	730	1,551
Lewis	3,275	2,407	5,682
Lincoln	1,268	774	2,042
Mason*	5,404	4,036	9,440
Okanogan	1,911	1,499	3,410
Pacific*	1,559	1,425	2,984
Pend Oreille	1,071	849	1,920
Pierce*	31,261	19,994	51,255
San Juan*	3,152	2,079	5,231
Skagit*	9,653	6,003	15,656
Skamania*	528	465	993
Snohomish*	30,056	19,173	49,229
Spokane	16,592	14,516	31,108
Stevens	3,349	2,227	5,576
Thurston*	11,063	7,679	18,742
Wahkaikum*	539	422	961
Walla Walla	2,038	1,246	3,284
Whatcom*	9,391	6,798	16,189
Whitman	1,127	1,002	2,129
Yakima	7,566	5,304	12,870
DOL	42	153	195
TOTAL	**285,125**	**191,026**	**476,151**
Source: Washington Vessel Registrations and Licenses			

Table 54: Impact on Recreational Boating Areas Impacted Oil Spill Scenarios							
Scenario	**Response**	**Lost Use for Duration of Spill Response and Oiled Areas**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$2,556	$1,431	$1,183	$1,723	$3,186	$260
	R-Fed	$292	$215	$469	$325	$586	$65
	R-ST	$179	$187	$404	$256	$511	$2
	R-3	$127	$182	$330	$213	$423	$3
	C-Fed	$121	$187	$334	$214	$432	$0
	C-ST	$147	$210	$392	$250	$504	$0
	C-3	$121	$187	$334	$214	$432	$0
IS-Crud	**N**	$2,149	$1,707	$6,447	$3,413	$9,860	$0
	R-Fed	$632	$632	$822	$695	$1,959	$0
	R-ST	$506	$569	$506	$506	$1,327	$0
	R-3	$379	$506	$379	$442	$1,011	$0
	C-Fed	$632	$569	$695	$632	$1,707	$0
	C-ST	$379	$379	$126	$316	$632	$0
	C-3	$379	$695	$885	$632	$1,770	$0
S1-Bunk	**N**	$2,152	$2,855	$1,961	$2,323	$5,173	$474
	R-Fed	$818	$295	$884	$666	$1,529	$85
	R-ST	$816	$194	$1,359	$789	$2,031	$97
	R-3	$398	$268	$864	$510	$1,530	$0
	R-ISB	$812	$441	$376	$543	$1,311	$0
S1-Dies	**N**	$1	$99	$0	$33	$148	$0
	R-Fed	$0	$0	$0	$0	$1	$0
	R-ST	$0	$0	$0	$0	$1	$0
	R-3	$0	$0	$0	$0	$1	$0
S2-Crud	**N**	$2,964	$867	$1,362	$1,732	$4,139	$149
	R-Fed	$683	$316	$307	$434	$903	$180
	R-ST	$386	$177	$307	$289	$773	$0
	R-3	$215	$277	$292	$262	$764	$0
	R-ISB	$322	$144	$291	$252	$753	$0
	C-Fed	$3,059	$1,528	$1,425	$2,004	$3,956	$298
	C-ST	$215	$162	$288	$223	$735	$0
	C-3	$499	$291	$370	$387	$661	$157
OC-Crud	**N**	$189	$2,340	$1,976	$1,502	$3,948	$0
	R-Fed	$177	$979	$1,307	$821	$1,999	$0
	R-ST	$185	$951	$1,260	$799	$1,921	$0
	R-3	$154	$858	$1,205	$739	$1,824	$0
	R-ISB	$207	$959	$1,238	$801	$1,893	$0
	C-Fed	$168	$914	$1,290	$791	$1,945	$0
	C-ST	$172	$953	$1,252	$792	$1,935	$0
	C-3	$133	$728	$1,058	$640	$1,589	$0
C1-Bunk	**N**	$0	$6,855	$8,574	$7,718	$10,151	$5,279
	R-Fed	$187	$2,724	$4,801	$2,571	$7,196	$0
	R-ST	$187	$1,873	$4,702	$2,252	$6,817	$0
	R-3	$187	$2,494	$4,312	$2,329	$6,465	$0
C2-Bunk	**N**	$698	$401	$626	$577	$884	$264
	R-Fed	$505	$231	$379	$374	$648	$93
	R-ST	$88	$236	$511	$280	$714	$0
	R-3	$516	$220	$467	$401	$720	$82
Lost-use values based on US Army Corps of Engineers - $6.50 per person-day. Assumes 6 days no boating for bunker, crude spills and 2 days for diesel. Degree of prohibition based on coverage of oil as in ports areas. Assumes 20% of boatowners would want to boat during the time period of response operations.							

Recreational Fishing (Sportfishing)

Impacts to recreational fishing (or sportfishing) were considered based on lost-use and lost sportfishing-related income. Sportfishing areas were assumed to be analogous to commercial fishing as in Figure 8.

Recreational marine fishing visitor days are shown in Table 55. The corresponding lost-use values (based on federal standards in Army Corps of Engineers 2001), based on a four-month fishing ban are shown in Table 56.

Table 55: Recreational Marine Fishing Visits

Year	Washington		Oregon	
	Annual	**Daily (Visitor Days)**	**Annual**	**Daily (Visitor Days)**
1993	NA	NA	226,218	620
1994	NA	NA	158,069	433
1995	NA	NA	222,908	611
1997	321,069	880	180,410	494
1998	325,772	893	168,332	461
1999	328,747	901	183,509	503
2000	422,704	1,158	271,257	743
2001	570,585	1,563	312,037	855
2002	413,561	1,133	273,252	749
Average	**397,073**	**1,088**	**231,466**	**634**
SD	**96,503**	**264**	**61,178**	**168**

Source: National Marine Fisheries

Potential spending losses by sportfishermen are shown in Tables 57 and 58. Results are shown in Table 59.

Table 56: Impact on Recreational Fishing by Oil Spill Scenarios							
Scenario	**Response**	**Lost Use for Duration of Spill Response and Fishing Ban**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$404	$187	$158	$250	$134	$519
	R-Fed	$37	$44	$81	$54	$24	$102
	R-ST	$20	$39	$71	$44	$25	$95
	R-3	$36	$39	$85	$54	$109	$0
	C-Fed	$22	$68	$119	$70	$49	$168
	C-ST	$15	$37	$76	$42	$31	$105
	C-3	$404	$187	$158	$250	$134	$519
IS-Crud	**N**	$304	$178	$681	$387	$261	$910
	R-Fed	$36	$85	$139	$119	$29	$177
	R-ST	$5	$83	$112	$90	$20	$131
	R-3	$56	$92	$88	$78	$19	$117
	C-Fed	$100	$73	$129	$100	$27	$156
	C-ST	$59	$71	$98	$76	$20	$117
	C-3	$42	$64	$87	$64	$22	$109
S1-Bunk	**N**	$341	$499	$311	$384	$100	$584
	R-Fed	$153	$49	$190	$131	$73	$277
	R-ST	$166	$49	$248	$154	$100	$355
	R-3	$64	$44	$134	$81	$48	$177
	R-ISB	$154	$71	$87	$104	$44	$192
S1-Dies	**N**	$258	$239	$127	$209	$350	$66
	R-Fed	$139	$87	$68	$98	$173	$24
	R-ST	$121	$98	$131	$117	$149	$83
	R-3	$17	$54	$144	$71	$202	$0
S2-Crud	**N**	$850	$283	$248	$462	$338	$1,137
	R-Fed	$178	$87	$90	$119	$51	$221
	R-ST	$107	$81	$90	$93	$12	$117
	R-3	$51	$83	$88	$75	$20	$115
	R-ISB	$105	$70	$85	$87	$19	$124
	C-Fed	$144	$71	$90	$102	$37	$178
	C-ST	$48	$63	$95	$68	$24	$117
	C-3	$170	$85	$195	$149	$58	$266
OC-Crud	**N**	$304	$474	$1,388	$721	$584	$1,889
	R-Fed	$219	$210	$289	$239	$42	$326
	R-ST	$256	$195	$287	$246	$46	$339
	R-3	$217	$200	$273	$231	$39	$307
	R-ISB	$231	$192	$265	$229	$37	$302
	C-Fed	$199	$185	$294	$226	$59	$345
	C-ST	$204	$202	$290	$233	$49	$333
	C-3	$221	$180	$268	$222	$44	$311
C1-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
C2-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
Lost-use values based on US Army Corps of Engineers - $6.50 per person-day. Assumes four-month fishing ban.							

Table 57: Trip-Related Expenditures for Recreational Fishing				
Expenditure Type	**Washington**		**Oregon**	
	Total Annual	**Daily**	**Total Annual**	**Daily**
Private Transportation	$41,039,000	$112,436	$19,748,000	$54,104
Food	$15,329,000	$41,997	$11,469,000	$31,422
Lodging	$6,746,000	$18,482	$9,916,000	$27,167
Public Transportation	$7,863,000	$21,542	$2,988,000	$8,186
Boat Fuel	$11,792,000	$32,307	$3,287,000	$9,005
Charter Fees	$2,834,000	$7,764	$3,410,000	$9,342
Access Boat Launching	$3,203,000	$8,775	$1,086,000	$2,975
Equipment Rental	$1,480,000	$4,055	$2,541,000	$6,962
Bait & Ice	$4,435,000	$12,151	$2,680,000	$7,342
Total	**$94,727,000**	**$259,526**	**$59,080,000**	**$161,863**
Source: Gentner, *et al.* 2000				

Table 58: Annual Expenditures for Recreational Fishing				
Expenditure Type	**Washington**		**Oregon**	
	Total Annual[1]	**Daily Business Delay Interest [2]**	**Total Annual[1]**	**Daily Business Delay Interest [2]**
Rods and Reels	$40,768,000	$21	$15,741,000	$8
Other Tackle	$41,141,000	$21	$12,129,000	$6
Gear	$9,610,000	$5	$3,058,000	$2
Camping Equipment	$6,710,000	$3	$2,339,000	$1
Binoculars	$1,581,000	$1	$1,128,000	$1
Clothing	$6,597,000	$3	$3,191,000	$2
Magazines	$1,201,000	$1	$391,000	$0
Club Dues	$768,000	$0	$845,000	$0
License Fees	$24,574,000	$13	$11,828,000	$6
Boat Accessories	$118,836,000	$62	$21,113,000	$11
Boat Purchase	$271,210,000	$141	$106,257,000	$55
Boat Maintenance	$114,332,000	$60	$22,345,000	$12
Fishing Vehicle	$495,663,000	$258	$191,383,000	$100
Fishing Vehicle Maintenance	$100,661,000	$52	$28,824,000	$15
Vacation Home	$77,775,000	$40	$41,199,000	$21
Vacation Home Maintenance	$11,858,000	$6	$53,170,000	$28
Total	**$1,401,065,000**	**$729**	**$557,176,000**	**$290**
[1]Source: Gentner, *et al.* 2000. [2]Interest for assumed delay on business (annual 7%, daily 0.019%).				

Table 59: Impact on Recreational Fishing by Oil Spill Scenarios							
Scenario	**Response**	**Lost Spending Income for Duration of Spill Response and Fishing Ban**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$743,288	$343,537	$290,445	$459,090	$246,722	$955,656
	R-Fed	$68,707	$81,200	$149,907	$99,938	$43,723	$187,384
	R-ST	$37,477	$71,830	$131,169	$81,200	$46,846	$174,891
	R-3	$65,584	$71,830	$156,153	$99,938	$199,876	$0
	C-Fed	$40,600	$124,922	$218,614	$128,045	$90,569	$309,183
	C-ST	$28,108	$68,707	$140,538	$78,077	$56,215	$193,630
	C-3	$743,288	$343,537	$290,445	$459,090	$246,722	$955,656
IS-Crud	**N**	$559,028	$327,921	$1,252,347	$712,058	$480,951	$1,673,960
	R-Fed	$65,584	$156,153	$256,091	$218,614	$53,092	$324,798
	R-ST	$9,369	$153,030	$206,122	$165,522	$37,477	$240,476
	R-3	$103,061	$168,645	$162,399	$143,661	$34,354	$215,491
	C-Fed	$184,261	$134,292	$237,353	$184,261	$49,969	$287,322
	C-ST	$109,307	$131,169	$181,137	$140,538	$37,477	$215,491
	C-3	$78,077	$118,676	$159,276	$118,676	$40,600	$199,876
S1-Bunk	**N**	$627,735	$918,180	$571,520	$705,812	$184,261	$1,074,333
	R-Fed	$281,075	$90,569	$349,783	$240,476	$134,292	$509,059
	R-ST	$306,060	$90,569	$455,967	$284,198	$184,261	$652,720
	R-3	$118,676	$81,200	$246,722	$149,907	$87,446	$324,798
	R-ISB	$284,198	$131,169	$159,276	$190,507	$81,200	$352,906
S1-Dies	**N**	$474,705	$440,351	$234,230	$384,136	$643,350	$121,799
	R-Fed	$256,091	$159,276	$124,922	$181,137	$318,552	$43,723
	R-ST	$221,737	$181,137	$240,476	$215,491	$274,829	$153,030
	R-3	$31,231	$99,938	$265,460	$131,169	$371,644	$0
S2-Crud	**N**	$1,564,653	$521,551	$455,967	$849,472	$621,489	$2,092,450
	R-Fed	$327,921	$159,276	$165,522	$218,614	$93,692	$405,998
	R-ST	$196,753	$149,907	$165,522	$171,768	$21,861	$215,491
	R-3	$93,692	$153,030	$162,399	$137,415	$37,477	$212,368
	R-ISB	$193,630	$128,045	$156,153	$159,276	$34,354	$227,983
	C-Fed	$265,460	$131,169	$165,522	$187,384	$68,707	$327,921
	C-ST	$87,446	$115,553	$174,891	$124,922	$43,723	$215,491
	C-3	$312,306	$156,153	$359,152	$274,829	$106,184	$490,320
OC-Crud	**N**	$559,028	$871,334	$2,554,663	$1,327,301	$1,074,333	$3,475,966
	R-Fed	$402,875	$387,259	$530,920	$440,351	$78,077	$599,628
	R-ST	$471,582	$359,152	$527,797	$452,844	$84,323	$624,612
	R-3	$399,752	$368,521	$502,813	$424,736	$71,830	$565,274
	R-ISB	$424,736	$352,906	$487,197	$421,613	$68,707	$555,905
	C-Fed	$365,398	$340,414	$540,289	$415,367	$109,307	$633,981
	C-ST	$374,767	$371,644	$534,043	$427,859	$90,569	$612,120
	C-3	$405,998	$331,044	$493,443	$409,121	$81,200	$571,520
C1-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
C2-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0

Lost-use values based on US Army Corps of Engineers - $6.50 per person-day. Assumes 6 days no boating for bunker, crude spills and 2 days for diesel. Degree of prohibition based on coverage of oil as in ports areas. Assumes 20% of boatowners would want to boat during the time period of response operations.

Wildlife Viewing and Hunting

To estimate the reduction in wildlife viewing and hunting expenditures (Table 60), it was assumed that viewing and hunting opportunities would be directly related to the percent total area covered by oil. It was assumed that the areas would be impacted for a total of four months, analogous to the commercial and recreational fishing ban. The results are shown in Tables 61 and 62.

Table 60: Wildlife Viewing Expenditures in Washington

Type	Annual Spending	Estimated Coastal Spending	Estimated Daily Coastal Spending
Wildlife Viewing	$980,000,000	$392,000,000	$1,073,973
Hunting	$350,000,000	$35,000,000	$95,890

Source: Washington Dept. of Fish and Wildlife

Another methodology is to look at the value of specific species of wildlife that are of interest to wildlife viewers and hunters and that are impacted by the oil spill scenarios Wildlife injuries are shown in Table 63 for all the oil spill scenarios. The injuries for waterfowl are expected to affect both wildlife viewers and hunters, while the shorebird injuries are assumed to affect only wildlife viewers. There are insignificant impacts on mammals and other bird species. These impacts are not factored into this analysis.

The estimates costs for hunting opportunity losses on a per-waterfowl individual basis are shown in Table 64. Bird and wildlife individual injuries are shown in Tables 65 and 66. No estimates of cost per bird or per wildlife individual for the purposes of bird-watching or wildlife-viewing were available.

Table 61: Lost Wildlife Spending by Oil Spill Scenarios: Wildlife Viewing							
Scenario	**Response**	**Lost Spending on Wildlife Viewing Activities**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$3,067,267	$1,417,644	$1,198,554	$1,894,488	$1,018,126	$3,943,629
	R-Fed	$283,529	$335,080	$618,608	$412,406	$180,427	$773,261
	R-ST	$154,652	$296,417	$541,282	$335,080	$193,315	$721,710
	R-3	$270,641	$296,417	$644,384	$412,406	$824,811	$0
	C-Fed	$167,540	$515,507	$902,137	$528,395	$373,743	$1,275,880
	C-ST	$115,989	$283,529	$579,945	$322,192	$231,978	$799,036
	C-3	$3,067,267	$1,417,644	$1,198,554	$1,894,488	$1,018,126	$3,943,629
IS-Crud	**N**	$2,306,894	$1,353,206	$5,167,958	$2,938,390	$1,984,702	$6,907,794
	R-Fed	$270,641	$644,384	$1,056,789	$902,137	$219,090	$1,340,318
	R-ST	$38,663	$631,496	$850,587	$683,047	$154,652	$992,351
	R-3	$425,293	$695,935	$670,159	$592,833	$141,764	$889,250
	C-Fed	$760,373	$554,170	$979,463	$760,373	$206,203	$1,185,666
	C-ST	$451,069	$541,282	$747,485	$579,945	$154,652	$889,250
	C-3	$322,192	$489,732	$657,271	$489,732	$167,540	$824,811
S1-Bunk	**N**	$2,590,423	$3,788,977	$2,358,445	$2,912,615	$760,373	$4,433,361
	R-Fed	$1,159,891	$373,743	$1,443,420	$992,351	$554,170	$2,100,691
	R-ST	$1,262,992	$373,743	$1,881,601	$1,172,779	$760,373	$2,693,524
	R-3	$489,732	$335,080	$1,018,126	$618,608	$360,855	$1,340,318
	R-ISB	$1,172,779	$541,282	$657,271	$786,148	$335,080	$1,456,307
S1-Dies	**N**	$1,958,927	$1,817,162	$966,576	$1,585,184	$2,654,861	$502,619
	R-Fed	$1,056,789	$657,271	$515,507	$747,485	$1,314,543	$180,427
	R-ST	$915,025	$747,485	$992,351	$889,250	$1,134,115	$631,496
	R-3	$128,877	$412,406	$1,095,452	$541,282	$1,533,633	$0
S2-Crud	**N**	$6,456,726	$2,152,242	$1,881,601	$3,505,448	$2,564,648	$8,634,743
	R-Fed	$1,353,206	$657,271	$683,047	$902,137	$386,630	$1,675,398
	R-ST	$811,924	$618,608	$683,047	$708,822	$90,214	$889,250
	R-3	$386,630	$631,496	$670,159	$567,058	$154,652	$876,362
	R-ISB	$799,036	$528,395	$644,384	$657,271	$141,764	$940,800
	C-Fed	$1,095,452	$541,282	$683,047	$773,261	$283,529	$1,353,206
	C-ST	$360,855	$476,844	$721,710	$515,507	$180,427	$889,250
	C-3	$1,288,768	$644,384	$1,482,083	$1,134,115	$438,181	$2,023,365
OC-Crud	**N**	$2,306,894	$3,595,662	$10,542,119	$5,477,262	$4,433,361	$14,343,983
	R-Fed	$1,662,510	$1,598,072	$2,190,905	$1,817,162	$322,192	$2,474,434
	R-ST	$1,946,039	$1,482,083	$2,178,017	$1,868,713	$347,967	$2,577,535
	R-3	$1,649,623	$1,520,746	$2,074,916	$1,752,724	$296,417	$2,332,669
	R-ISB	$1,752,724	$1,456,307	$2,010,477	$1,739,836	$283,529	$2,294,006
	C-Fed	$1,507,858	$1,404,757	$2,229,568	$1,714,061	$451,069	$2,616,198
	C-ST	$1,546,521	$1,533,633	$2,203,793	$1,765,612	$373,743	$2,525,984
	C-3	$1,675,398	$1,366,094	$2,036,253	$1,688,286	$335,080	$2,358,445
C1-Bunk	**N**	$0	$16,083,820	$20,117,662	$18,107,185	$23,816,425	$12,385,057
	R-Fed	$438,181	$6,392,287	$11,263,829	$6,031,432	$16,882,856	$0
	R-ST	$438,181	$4,394,698	$11,031,851	$5,283,947	$15,993,606	$0
	R-3	$438,181	$5,851,005	$10,116,826	$5,464,375	$15,168,795	$0
C2-Bunk	**N**	$1,636,735	$940,800	$1,469,195	$1,353,206	$2,074,916	$618,608
	R-Fed	$1,185,666	$541,282	$889,250	$876,362	$1,520,746	$219,090
	R-ST	$206,203	$554,170	$1,198,554	$657,271	$1,675,398	$0
	R-3	$1,211,442	$515,507	$1,095,452	$940,800	$1,688,286	$193,315

Table 62: Lost Wildlife Spending by Oil Spill Scenarios: Hunting							
Scenario	**Response**	**Lost Spending on Hunting Activities**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$273,862	$126,575	$107,013	$169,150	$90,904	$352,108
	R-Fed	$25,315	$29,918	$55,233	$36,822	$16,110	$69,041
	R-ST	$13,808	$26,466	$48,329	$29,918	$17,260	$64,438
	R-3	$24,164	$26,466	$57,534	$36,822	$73,644	$0
	C-Fed	$14,959	$46,027	$80,548	$47,178	$33,370	$113,917
	C-ST	$10,356	$25,315	$51,781	$28,767	$20,712	$71,342
	C-3	$273,862	$126,575	$107,013	$169,150	$90,904	$352,108
IS-Crud	**N**	$205,972	$120,821	$461,423	$262,355	$177,205	$616,764
	R-Fed	$24,164	$57,534	$94,356	$80,548	$19,562	$119,671
	R-ST	$3,452	$56,383	$75,945	$60,986	$13,808	$88,602
	R-3	$37,972	$62,137	$59,835	$52,931	$12,657	$79,397
	C-Fed	$67,890	$49,479	$87,452	$67,890	$18,411	$105,863
	C-ST	$40,274	$48,329	$66,739	$51,781	$13,808	$79,397
	C-3	$28,767	$43,726	$58,685	$43,726	$14,959	$73,644
S1-Bunk	**N**	$231,287	$338,300	$210,574	$260,054	$67,890	$395,834
	R-Fed	$103,561	$33,370	$128,876	$88,602	$49,479	$187,561
	R-ST	$112,767	$33,370	$167,999	$104,712	$67,890	$240,492
	R-3	$43,726	$29,918	$90,904	$55,233	$32,219	$119,671
	R-ISB	$104,712	$48,329	$58,685	$70,191	$29,918	$130,027
S1-Dies	**N**	$174,903	$162,246	$86,301	$141,534	$237,040	$44,877
	R-Fed	$94,356	$58,685	$46,027	$66,739	$117,369	$16,110
	R-ST	$81,698	$66,739	$88,602	$79,397	$101,260	$56,383
	R-3	$11,507	$36,822	$97,808	$48,329	$136,931	$0
S2-Crud	**N**	$576,491	$192,164	$167,999	$312,985	$228,985	$770,956
	R-Fed	$120,821	$58,685	$60,986	$80,548	$34,520	$149,588
	R-ST	$72,493	$55,233	$60,986	$63,287	$8,055	$79,397
	R-3	$34,520	$56,383	$59,835	$50,630	$13,808	$78,246
	R-ISB	$71,342	$47,178	$57,534	$58,685	$12,657	$84,000
	C-Fed	$97,808	$48,329	$60,986	$69,041	$25,315	$120,821
	C-ST	$32,219	$42,575	$64,438	$46,027	$16,110	$79,397
	C-3	$115,068	$57,534	$132,328	$101,260	$39,123	$180,657
OC-Crud	**N**	$205,972	$321,040	$941,256	$489,039	$395,834	$1,280,707
	R-Fed	$148,438	$142,684	$195,616	$162,246	$28,767	$220,931
	R-ST	$173,753	$132,328	$194,465	$166,849	$31,068	$230,136
	R-3	$147,287	$135,780	$185,259	$156,492	$26,466	$208,273
	R-ISB	$156,492	$130,027	$179,506	$155,342	$25,315	$204,821
	C-Fed	$134,630	$125,424	$199,068	$153,040	$40,274	$233,588
	C-ST	$138,082	$136,931	$196,766	$157,643	$33,370	$225,533
	C-3	$149,588	$121,972	$181,807	$150,739	$29,918	$210,574
C1-Bunk	**N**	$0	$1,436,049	$1,796,211	$1,616,705	$2,126,457	$1,105,803
	R-Fed	$39,123	$570,737	$1,005,694	$538,518	$1,507,391	$0
	R-ST	$39,123	$392,382	$984,982	$471,779	$1,427,994	$0
	R-3	$39,123	$522,409	$903,284	$487,888	$1,354,350	$0
C2-Bunk	**N**	$146,136	$84,000	$131,178	$120,821	$185,259	$55,233
	R-Fed	$105,863	$48,329	$79,397	$78,246	$135,780	$19,562
	R-ST	$18,411	$49,479	$107,013	$58,685	$149,588	$0
	R-3	$108,164	$46,027	$97,808	$84,000	$150,739	$17,260

Table 63: Injured Waterfowl in Oil Spill Scenarios							
Scenario	**Response**	**Estimated Number of Waterfowl Injured**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	49,889	20,702	16,972	29,188	65,236	0
	R-Fed	4,148	3,055	6,660	4,621	8,317	925
	R-ST	2,515	2,649	5,724	4,430	9,749	0
	R-3	1,768	2,595	4,667	3,010	5,996	23
	C-Fed	3,741	2,888	7,408	4,679	9,482	0
	C-ST	2,058	2,979	5,559	3,532	7,162	0
	C-3	1,683	2,666	4,722	3,024	6,126	0
IS-Crud	**N**	17,753	13,443	38,410	23,202	49,894	0
	R-Fed	8,535	7,831	8,817	8,395	9,411	7,378
	R-ST	7,022	7,637	7,404	7,596	10,679	4,512
	R-3	6,536	7,266	6,696	6,833	7,601	6,065
	C-Fed	7,800	7,657	8,377	7,945	8,707	7,182
	C-ST	2,706	5,233	5,606	4,515	7,670	1,360
	C-3	6,482	7,245	6,521	6,749	7,609	5,890
S1-Bunk	**N**	17,432	17,432	12,088	15,650	21,820	9,481
	R-Fed	4,539	4,539	8,734	5,937	10,781	1,093
	R-ST	7,907	4,550	10,401	5,734	9,584	1,884
	R-3	4,394	4,394	7,116	5,301	8,444	2,158
	R-ISB	5,177	5,621	4,004	4,934	6,605	3,263
S1-Dies	**N**	26,773	7,647	10,545	14,988	35,605	0
	R-Fed	4,239	15,604	10,598	10,147	21,539	0
	R-ST	13,291	7,523	10,915	8,933	16,794	1,073
	R-3	2,755	15,508	10,456	9,573	22,417	0
S2-Crud	**N**	32,342	12,820	16,984	20,715	41,280	151
	R-Fed	10,021	6,949	7,279	8,083	11,456	4,709
	R-ST	7,191	5,617	7,260	7,686	12,763	2,608
	R-3	5,686	6,510	7,097	6,431	7,849	5,013
	R-ISB	6,613	5,161	7,097	6,290	8,305	4,276
	C-Fed	9,455	5,427	7,190	7,358	11,396	3,319
	C-ST	5,680	5,356	7,099	6,045	7,899	4,191
	C-3	5,392	4,850	7,051	5,765	8,058	3,471
OC-Crud	**N**	275,245	49,834	115,927	102,764	259,352	0
	R-Fed	28,056	28,354	33,284	29,898	35,771	24,026
	R-ST	168,635	28,823	33,864	77,108	235,718	0
	R-3	27,901	26,808	32,102	28,937	34,527	23,347
	R-ISB	27,685	28,443	32,890	29,673	35,297	24,049
	C-Fed	157,607	27,826	33,619	73,018	219,646	0
	C-ST	28,012	28,302	33,017	29,777	35,396	24,158
	C-3	27,477	26,503	32,251	28,744	34,895	22,592
C1-Bunk	**N**	34,479	39,078	41,317	38,291	45,264	31,318
	R-Fed	18,202	25,118	26,825	23,382	32,514	14,250
	R-ST	15,451	24,739	26,724	24,888	46,642	3,134
	R-3	17,398	23,352	23,826	21,525	28,690	14,361
C2-Bunk	**N**	524	299	471	431	667	196
	R-Fed	376	174	282	278	480	75
	R-ST	72	178	378	170	354	0
	R-3	386	166	346	299	534	65

Table 64: Hunting Losses Due to Injured Waterfowl in Oil Spill Scenarios							
Scenario	**Response**	**Hunting Losses Due to Injured Waterfowl[1]**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$4,290,440	$1,780,407	$1,459,634	$2,510,160	$5,610,335	$0
	R-Fed	$356,754	$262,727	$572,725	$397,402	$715,294	$79,510
	R-ST	$216,274	$227,783	$492,292	$380,969	$838,412	$0
	R-3	$152,040	$223,129	$401,332	$258,834	$515,682	$1,985
	C-Fed	$321,701	$248,367	$637,087	$402,385	$815,462	$0
	C-ST	$176,987	$256,187	$478,096	$303,757	$615,935	$0
	C-3	$144,734	$229,242	$406,118	$260,031	$526,799	$0
IS-Crud	**N**	$1,526,795	$1,156,100	$3,303,286	$1,995,393	$4,290,859	$0
	R-Fed	$734,052	$673,430	$758,301	$721,928	$809,358	$634,497
	R-ST	$603,928	$656,779	$636,783	$653,221	$918,394	$388,047
	R-3	$562,090	$624,918	$575,873	$587,627	$653,671	$521,583
	C-Fed	$670,806	$658,495	$720,414	$683,238	$748,795	$617,682
	C-ST	$232,742	$450,034	$482,084	$388,287	$659,597	$116,976
	C-3	$557,434	$623,073	$560,793	$580,433	$654,364	$506,503
S1-Bunk	**N**	$1,499,115	$1,499,115	$1,039,599	$1,345,943	$1,876,546	$815,340
	R-Fed	$390,320	$390,320	$751,098	$510,580	$927,170	$93,989
	R-ST	$679,961	$391,321	$894,457	$493,123	$824,263	$161,983
	R-3	$377,881	$377,881	$611,976	$455,913	$726,223	$185,602
	R-ISB	$445,237	$483,382	$344,313	$424,311	$568,025	$280,596
S1-Dies	**N**	$2,302,500	$657,612	$906,852	$1,288,988	$3,062,047	$0
	R-Fed	$364,519	$1,341,932	$911,401	$872,618	$1,852,336	$0
	R-ST	$1,143,043	$647,013	$938,680	$768,267	$1,444,256	$92,277
	R-3	$236,916	$1,333,648	$899,238	$823,268	$1,927,865	$0
S2-Crud	**N**	$2,781,443	$1,102,548	$1,460,605	$1,781,532	$3,550,055	$13,010
	R-Fed	$861,815	$597,586	$625,969	$695,123	$985,233	$405,013
	R-ST	$618,434	$483,082	$624,340	$660,956	$1,097,597	$224,315
	R-3	$488,954	$559,894	$610,339	$553,062	$675,023	$431,102
	R-ISB	$568,719	$443,860	$610,339	$540,973	$714,250	$367,696
	C-Fed	$813,169	$466,747	$618,332	$632,749	$980,070	$285,428
	C-ST	$488,506	$460,635	$610,517	$519,886	$679,319	$360,453
	C-3	$463,741	$417,111	$606,394	$495,748	$692,983	$298,514
OC-Crud	**N**	$23,671,053	$4,285,748	$9,969,691	$8,837,743	$22,304,305	$0
	R-Fed	$2,412,850	$2,438,483	$2,862,457	$2,571,264	$3,076,277	$2,066,250
	R-ST	$14,502,634	$2,478,776	$2,912,329	$6,631,246	$20,271,782	$0
	R-3	$2,399,449	$2,305,508	$2,760,781	$2,488,579	$2,969,314	$2,007,845
	R-ISB	$2,380,877	$2,446,128	$2,828,550	$2,551,852	$3,035,529	$2,068,174
	C-Fed	$13,554,224	$2,393,064	$2,891,238	$6,279,509	$18,889,530	$0
	C-ST	$2,409,028	$2,433,986	$2,839,433	$2,560,816	$3,044,040	$2,077,592
	C-3	$2,363,024	$2,279,290	$2,773,552	$2,471,956	$3,001,005	$1,942,906
C1-Bunk	**N**	$2,965,163	$3,360,672	$3,553,293	$3,293,043	$3,892,724	$2,693,361
	R-Fed	$1,565,407	$2,160,158	$2,306,925	$2,010,830	$2,796,162	$1,225,498
	R-ST	$1,328,756	$2,127,583	$2,298,250	$2,140,358	$4,011,171	$269,546
	R-3	$1,496,210	$2,008,257	$2,049,065	$1,851,177	$2,467,351	$1,235,004
C2-Bunk	**N**	$45,043	$25,695	$40,534	$37,091	$57,338	$16,844
	R-Fed	$32,370	$14,977	$24,257	$23,868	$41,274	$6,461
	R-ST	$6,229	$15,322	$32,531	$14,657	$30,475	$0
	R-3	$33,212	$14,280	$29,732	$25,741	$45,895	$5,588

[1]Based on value of duck species for hunting of $86 (extrapolated to 2004 dollars from Norton and Thomas 1994)

Table 65: Total Injured Birds in Oil Spill Scenarios							
Scenario	**Response**	**Estimated Total Number of Birds Injured**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	55,532	23,097	19,243	32,624	72,489	0
	R-Fed	4,578	3,445	7,548	5,190	9,428	953
	R-ST	2,752	2,971	6,437	4,904	10,725	0
	R-3	1,942	2,907	5,242	3,364	6,757	0
	C-Fed	4,125	3,244	8,358	5,242	10,710	0
	C-ST	2,255	3,332	6,253	3,947	8,084	0
	C-3	1,845	2,991	5,301	3,379	6,900	0
IS-Crud	**N**	37,584	26,007	92,927	52,173	123,704	0
	R-Fed	12,854	10,966	13,611	12,477	15,201	9,752
	R-ST	8,800	10,447	9,825	10,679	18,559	2,166
	R-3	7,497	9,454	7,927	8,293	10,350	6,235
	C-Fed	10,884	10,500	12,430	11,271	13,315	9,228
	C-ST	4,590	6,919	8,192	6,567	10,220	2,914
	C-3	7,352	9,397	7,457	8,069	10,371	5,766
S1-Bunk	**N**	25,403	25,403	16,959	22,588	32,339	12,837
	R-Fed	5,025	5,025	11,656	7,235	14,892	0
	R-ST	10,348	5,044	14,290	6,916	12,999	833
	R-3	4,797	4,797	9,099	6,231	11,199	1,263
	R-ISB	6,035	6,736	4,180	5,650	8,291	3,009
S1-Dies	**N**	33,837	9,807	13,432	19,025	44,935	0
	R-Fed	5,586	19,356	13,457	12,800	26,616	0
	R-ST	16,340	8,863	13,244	10,688	20,865	510
	R-3	3,813	19,257	13,272	12,114	27,687	0
S2-Crud	**N**	55,532	17,645	23,371	32,183	73,028	0
	R-Fed	12,948	8,647	9,267	10,288	14,937	5,638
	R-ST	8,748	6,709	9,213	9,598	16,835	2,361
	R-3	6,616	8,006	8,982	7,868	10,247	5,490
	R-ISB	7,930	5,995	8,962	7,629	10,642	4,616
	C-Fed	12,092	6,404	9,122	9,206	14,895	3,517
	C-ST	6,609	6,254	8,998	7,287	10,272	4,302
	C-3	6,201	5,504	8,897	6,868	10,452	3,283
OC-Crud	**N**	417,553	72,706	174,178	153,783	393,329	0
	R-Fed	39,318	39,782	47,339	42,147	51,153	33,140
	R-ST	254,427	40,500	48,226	114,385	357,069	0
	R-3	39,081	37,415	45,527	40,674	49,243	32,106
	R-ISB	38,750	39,918	46,733	41,800	50,424	33,177
	C-Fed	237,554	38,974	47,851	108,126	332,477	0
	C-ST	39,251	39,702	46,928	41,960	50,577	33,344
	C-3	38,434	36,949	45,755	40,379	49,809	30,950
C1-Bunk	**N**	49,733	48,910	55,456	51,367	58,498	44,236
	R-Fed	21,007	29,118	33,763	27,963	40,874	15,051
	R-ST	18,448	28,793	33,885	28,580	52,234	4,926
	R-3	19,979	26,958	29,511	25,483	35,352	15,613
C2-Bunk	**N**	1,389	506	1,121	1,005	1,910	100
	R-Fed	649	214	333	399	848	0
	R-ST	171	218	500	306	851	0
	R-3	748	203	407	453	1,004	0

Table 66: Total Injured Wildlife in Oil Spill Scenarios (Includes Birds)							
Scenario	**Response**	**Estimated Total Number of Wildlife Injured (Includes Birds)**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	55,536	23,098	19,244	32,626	72,493	0
	R-Fed	4,579	3,446	7,548	5,191	9,429	953
	R-ST	2,752	2,971	6,437	4,904	10,726	0
	R-3	1,943	2,907	5,243	3,364	6,758	0
	C-Fed	4,125	3,244	8,358	5,243	10,711	0
	C-ST	2,256	3,333	6,254	3,947	8,085	0
	C-3	1,845	2,991	5,301	3,379	6,900	0
IS-Crud	**N**	37,587	26,010	92,936	52,178	123,716	0
	R-Fed	12,855	10,967	13,612	12,478	15,203	9,753
	R-ST	8,801	10,448	9,826	4,512	18,561	2,166
	R-3	7,498	9,455	7,928	8,293	10,351	6,236
	C-Fed	10,885	10,501	12,431	11,272	13,316	9,229
	C-ST	4,675	7,021	8,265	6,654	10,299	3,008
	C-3	7,352	9,397	7,458	8,069	10,372	5,766
S1-Bunk	**N**	25,405	25,405	16,960	22,590	32,342	12,838
	R-Fed	5,026	5,026	11,657	7,236	14,893	0
	R-ST	10,349	5,044	14,292	6,916	13,000	833
	R-3	4,797	4,797	9,100	6,231	11,200	1,263
	R-ISB	6,035	6,736	4,180	5,650	8,292	3,009
S1-Dies	**N**	33,840	9,807	13,433	19,027	44,938	0
	R-Fed	5,586	19,357	13,458	12,801	26,618	0
	R-ST	16,341	8,864	13,245	10,689	20,867	510
	R-3	3,814	19,259	13,273	12,115	27,689	0
S2-Crud	**N**	55,535	17,646	23,373	32,184	73,031	0
	R-Fed	12,949	8,648	9,268	10,288	14,938	5,638
	R-ST	8,749	6,709	9,214	9,598	16,836	2,361
	R-3	6,617	8,007	8,983	7,869	10,247	5,490
	R-ISB	7,930	5,995	8,963	7,630	10,643	4,617
	C-Fed	12,093	6,405	9,122	9,207	14,896	3,517
	C-ST	6,609	6,254	8,999	7,287	10,273	4,302
	C-3	6,201	5,505	8,898	6,868	10,452	3,284
OC-Crud	**N**	417,664	72,725	174,224	153,824	393,434	0
	R-Fed	39,329	39,793	47,352	42,158	51,166	33,149
	R-ST	254,495	40,511	48,239	114,415	357,164	0
	R-3	39,092	37,425	45,539	40,685	49,256	32,114
	R-ISB	38,761	39,928	46,746	41,812	50,437	33,186
	C-Fed	237,617	38,985	47,864	108,155	332,565	0
	C-ST	39,261	39,713	46,941	41,972	50,590	33,353
	C-3	38,444	36,959	45,768	40,390	49,822	30,958
C1-Bunk	**N**	49,740	48,918	55,464	51,374	58,506	44,242
	R-Fed	21,011	29,123	33,768	27,967	40,880	15,054
	R-ST	18,451	28,798	33,890	28,585	52,243	4,926
	R-3	19,982	26,962	29,515	25,487	35,357	15,616
C2-Bunk	**N**	1,396	511	1,128	1,012	1,919	104
	R-Fed	655	217	338	403	856	0
	R-ST	173	221	506	310	856	0
	R-3	755	206	412	458	1,012	0

Tourism Impacts

Impacts of the oil spill scenarios on the area's tourism (other than visits to national and state parks) were measured by looking at percentage area coverage of the tourist areas shown in Figure 12. It was assumed that 30% of coastal county tourist spending would be impacted for a total of 30 days for diesel spills, 60 days for crude oil spills, and 90 days for bunker spills, based on the areas directly impacted by oil at concentrations of greater than 1 g/m^2 on the shoreline (visible oiling). The time of impact is related to the estimated time to cleanup the oil from impacted shorelines and for tourists to return to those areas. The estimated daily tourist income is shown in Table 67. The impacted areas are shown in Table 68. The corresponding tourist spending and income losses are shown in Table 69.

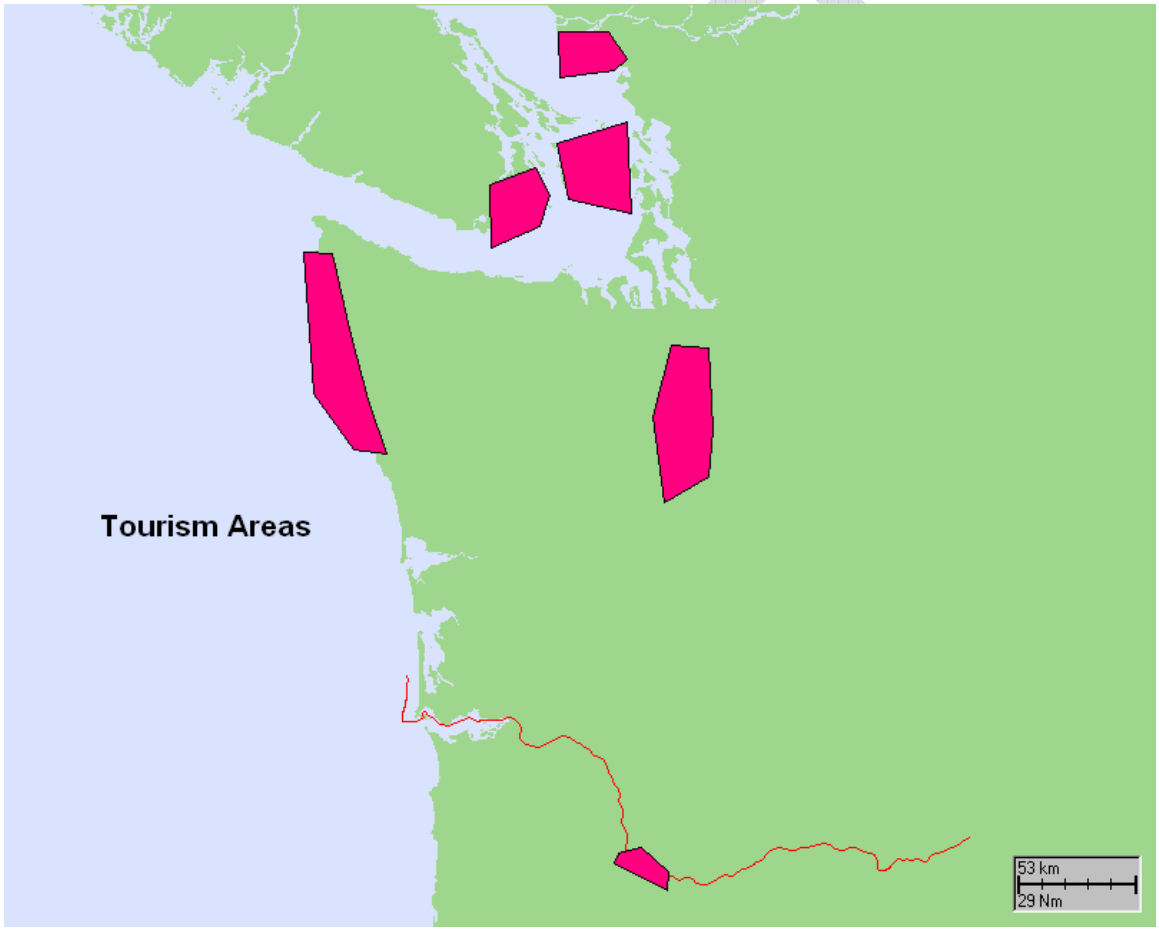


Figure 12: Most-Visited Coastal Tourist Areas.

Table 67: Estimated Daily Tourist Income By Coastal County and Tourism Area		
County	**Total Tourism Income**	**30% Coastal Tourist-Related Income/Day**
Grays Harbor*	$63,800,000	$52,438
TOTAL	**$63,800,000**	**$52,438**
Clark*	$78,500,000	$64,521
Cowlitz*	$25,900,000	$21,288
Klickitat*	$6,400,000	$5,260
Pacific*	$25,400,000	$20,877
Skamania*	$11,400,000	$9,370
Wahkaikum*	$800,000	$658
Portland	$644,000,000	$529,315
TOTAL	**$792,400,000**	**$651,288**
San Juan*	$37,400,000	$30,740
Skagit*	$47,900,000	$39,370
Whatcom*	$99,000,000	$81,370
TOTAL	**$184,300,000**	**$151,479**
Island*	$38,200,000	$31,397
Jefferson*	$22,800,000	$18,740
King*	$1,866,000,000	$1,533,699
Kitsap*	$51,400,000	$42,247
Mason*	$24,100,000	$19,808
Pierce*	$177,000,000	$145,479
Snohomish*	$158,400,000	$130,192
Thurston*	$52,600,000	$43,233
TOTAL	**$2,390,500,000**	**$1,964,795**
Clallam*	$39,200,000	$32,219
TOTAL	**$39,200,000**	**$32,219**
Victoria	$168,000,000	$138,082
TOTAL	**$168,000,000**	**$138,082**
Vancouver	$550,000,000	$452,055
TOTAL	**$550,000,000**	**$452,055**
GRAND TOTAL	**$4,188,200,000**	**$3,442,356**

Table 68: Impact on Tourism by Oil Spill Scenarios							
Scenario	**Response**	**% Area Covered by Oil (> 1 g/m^2)**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	6.41%	2.97%	2.50%	3.96%	8.23%	0.00%
	R-Fed	1.10%	0.00%	0.87%	0.65%	1.81%	0.00%
	R-ST	0.47%	0.00%	0.80%	0.42%	1.23%	0.00%
	R-3	0.44%	0.03%	0.85%	0.44%	1.26%	0.00%
	C-Fed	0.37%	0.00%	0.72%	0.36%	1.08%	0.00%
	C-ST	0.49%	0.02%	0.85%	0.45%	1.28%	0.00%
	C-3	0.37%	0.00%	0.72%	0.36%	1.08%	0.00%
IS-Crud	**N**	4.14%	1.40%	6.43%	3.99%	9.03%	0.00%
	R-Fed	0.20%	0.00%	1.94%	0.84%	2.83%	0.00%
	R-ST	0.00%	0.01%	1.32%	0.47%	1.95%	0.00%
	R-3	0.01%	0.11%	0.75%	0.29%	1.10%	0.00%
	C-Fed	0.18%	0.00%	1.46%	0.55%	2.15%	0.00%
	C-ST	0.05%	0.05%	0.97%	0.35%	1.41%	0.00%
	C-3	0.01%	0.00%	0.69%	0.23%	1.02%	0.00%
S1-Bunk	**N**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-Fed	0.00%	0.00%	0.03%	0.01%	0.04%	-0.02%
	R-ST	0.00%	0.00%	0.05%	0.02%	0.08%	-0.04%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ISB	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
S1-Dies	**N**	0.72%	0.00%	0.00%	0.24%	1.06%	0.00%
	R-Fed	0.09%	0.00%	0.00%	0.03%	0.14%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.01%	0.00%	0.00%	0.00%	0.02%	0.00%
S2-Crud	**N**	0.79%	0.00%	0.20%	0.33%	1.15%	0.00%
	R-Fed	0.00%	0.00%	0.27%	0.09%	0.40%	0.00%
	R-ST	0.00%	0.00%	0.26%	0.09%	0.39%	0.00%
	R-3	0.00%	0.00%	0.31%	0.10%	0.46%	0.00%
	R-ISB	0.00%	0.00%	0.20%	0.07%	0.29%	0.00%
	C-Fed	0.00%	0.00%	0.31%	0.10%	0.47%	0.00%
	C-ST	0.00%	0.00%	0.35%	0.12%	0.52%	0.00%
	C-3	0.48%	0.26%	1.44%	0.72%	1.98%	0.00%
OC-Crud	**N**	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ISB	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	C-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
C1-Bunk	**N**	0.00%	0.01%	0.79%	0.40%	0.55%	1.51%
	R-Fed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-ST	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	R-3	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
C2-Bunk	**N**	0.00%	1.17%	0.00%	0.39%	1.74%	0.00%
	R-Fed	0.00%	0.30%	0.00%	0.10%	0.45%	0.00%
	R-ST	0.10%	0.10%	0.06%	0.05%	0.12%	0.02%
	R-3	0.00%	0.24%	0.00%	0.08%	0.35%	0.00%
Assumes 30-day reduction in tourism for diesel spills, 60-day reduction for crude spills, and 90-day reduction for Bunker spills, with 30% loss of tourist dollars.							

Table 69: Impact on Tourism by Oil Spill Scenarios							
Scenario	**Response**	**Reduction in Tourist Spending and Income**					
		5th	**50th**	**95th**	**Mean**	**Mean+2SD**	**Mean-2SD**
SI-Crud	**N**	$13,239,301	$6,134,278	$5,163,534	$8,179,038	$16,998,354	$0
	R-Fed	$2,271,955	$0	$1,796,910	$1,342,519	$3,738,399	$0
	R-ST	$970,744	$0	$1,652,331	$867,474	$2,540,459	$0
	R-3	$908,782	$61,962	$1,755,602	$908,782	$2,602,421	$0
	C-Fed	$764,203	$0	$1,487,098	$743,549	$2,230,647	$0
	C-ST	$1,012,053	$41,308	$1,755,602	$929,436	$2,643,729	$0
	C-3	$764,203	$0	$1,487,098	$743,549	$2,230,647	$0
IS-Crud	**N**	$8,550,812	$2,891,579	$13,280,609	$8,241,000	$18,650,685	$0
	R-Fed	$413,083	$0	$4,006,902	$1,734,947	$5,845,120	$0
	R-ST	$0	$20,654	$2,726,346	$970,744	$4,027,557	$0
	R-3	$20,654	$227,195	$1,549,060	$598,970	$2,271,955	$0
	C-Fed	$371,774	$0	$3,015,504	$1,135,977	$4,440,639	$0
	C-ST	$103,271	$103,271	$2,003,451	$722,895	$2,912,233	$0
	C-3	$20,654	$0	$1,425,135	$475,045	$2,106,722	$0
S1-Bunk	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$92,944	$30,981	$123,925	$0
	R-ST	$0	$0	$154,906	$61,962	$247,850	$0
	R-3	$0	$0	$0	$0	$0	$0
	R-ISB	$0	$0	$0	$0	$0	$0
S1-Dies	**N**	$743,549	$0	$0	$247,850	$1,094,669	$0
	R-Fed	$92,944	$0	$0	$30,981	$144,579	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$10,327	$0	$0	$0	$20,654	$0
S2-Crud	**N**	$1,631,677	$0	$413,083	$681,586	$2,375,226	$0
	R-Fed	$0	$0	$557,662	$185,887	$826,165	$0
	R-ST	$0	$0	$537,008	$185,887	$805,511	$0
	R-3	$0	$0	$640,278	$206,541	$950,090	$0
	R-ISB	$0	$0	$413,083	$144,579	$598,970	$0
	C-Fed	$0	$0	$640,278	$206,541	$970,744	$0
	C-ST	$0	$0	$722,895	$247,850	$1,074,015	$0
	C-3	$991,399	$537,008	$2,974,196	$1,487,098	$4,089,519	$0
OC-Crud	**N**	$0	$0	$0	$0	$0	$0
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
	R-ISB	$0	$0	$0	$0	$0	$0
	C-Fed	$0	$0	$0	$0	$0	$0
	C-ST	$0	$0	$0	$0	$0	$0
	C-3	$0	$0	$0	$0	$0	$0
C1-Bunk	**N**	$0	$30,981	$2,447,515	$1,239,248	$4,678,162	$1,703,966
	R-Fed	$0	$0	$0	$0	$0	$0
	R-ST	$0	$0	$0	$0	$0	$0
	R-3	$0	$0	$0	$0	$0	$0
C2-Bunk	**N**	$0	$3,624,801	$0	$1,208,267	$5,390,729	$0
	R-Fed	$0	$929,436	$0	$309,812	$1,394,154	$0
	R-ST	$309,812	$309,812	$185,887	$154,906	$371,774	$61,962
	R-3	$0	$743,549	$0	$247,850	$1,084,342	$0

Value of Lost Oil

The market value of the spilled oil is an additional economic impact of an oil spill, assuming that the oil cannot be recovered and sufficiently processed for use for anything other than waste oil. The value of the lost oil for the scenarios is shown in Table 70.

Table 70: Value of Oil Lost in Oil Spill Scenarios

Oil Type	Barrels Lost	Price Per Barrel[1]	Total Loss
Crude Oil (Alaska North Slope)	65,000	$34.61/bbl	$2,249,650
Diesel Fuel	65,000	$42.00/bbl	$2,730,000
Bunker C	25,000	$32.59/bbl	$814,750

[1]Based on spot market prices in *Oil and Gas Journal* 12 July 2004

The value of the lost oil is not dependent on the location of the spill, its spread or impact, or the response methodology.

Socioeconomic Impact Comparison: Response Capabilities and Methods

The socioeconomic impacts that occurred as a result of the oil spill scenarios were compared with respect to the different response capabilities as shown in Table 71. This table shows the *relative rank order* of impacts, comparing the mechanical recovery responses with each other and the no response option, and the chemical dispersant responses with each other. In cases where there were in situ burning (ISB) responses with no dispersant response options, the impacts with the ISB response were compared to the mechanical recovery responses. When there were dispersant responses (denoted by "C"), the ISB responses were compared to the dispersant response option results. Average rank comparisons are shown in Table 72.

Table 71: Summary of Ranking of Socioeconomic Impacts By Response Type Within Scenarios																									
Scenario		Socioeconomic Factor Impact Ranking (1 = worst) of Mean Impact																							
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	Total
SIC	N	3	3	3	3	3	3	1	3	3	3	1	3	2	2	3	3	3	3	3	3	3	2	4	2.74
	R-Fed	4	4	4	4	4	4	4	2	2	3	4	2	4	4	3	3	4	3	3	3	3	4	3	3.39
	R-ST	2	2	2	2	1	2	1	2	2	1	1	2	2	2	1	1	2	2	2	2	2	1	2	1.70
	R-3	1	1	1	1	2	1	2	3	3	1	2	3	1	1	1	1	1	3	3	3	3	2	1	1.78
	C-Fed	2	3	2	2	3	2	3	1	1	1	3	1	2	2	1	1	2	1	1	1	1	3	2	1.78
	C-ST	1	1	1	1	1	1	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1.09
	C-3	2	2	2	2	3	2	4	2	2	2	2	2	3	3	3	2	2	2	2	2	2	3	2	2.30
ISC	N	3	3	3	3	2	3	2	3	3	3	4	3	2	2	2	3	3	3	3	3	3	2	3	2.78
	R-Fed	4	4	4	4	4	4	3	4	4	3	1	4	4	4	4	4	4	4	4	4	4	4	4	3.78
	R-ST	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1.00
	R-3	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2.04
	C-Fed	1	1	1	1	1	3	3	3	3	2	3	3	2	2	3	3	1	3	3	3	3	2	3	2.30
	C-ST	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1.09
	C-3	3	3	2	3	3	1	1	3	3	2	1	3	2	2	3	3	3	3	3	3	3	2	2	2.48
S1B	N	2	2	3	2	2	2	1	2	2	2	1	2	3	3	3	3	2	2	2	2	2	3	1	2.13
	R-Fed	5	5	5	5	4	2	1	5	5	2	1	5	4	4	4	4	5	5	5	5	5	4	3	4.04
	R-ST	4	4	4	4	5	2	1	4	4	2	1	4	5	5	2	2	4	4	4	4	4	5	3	3.52
	R-3	1	1	1	1	2	1	2	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1.17
	R-ISB	4	2	2	3	4	2	3	3	3	1	3	3	2	2	3	3	2	3	3	3	3	3	2	2.70
S1D	N	2	2	2	2	1	3	1	2	2	3	1	2	4	4	2	2	2	2	2	2	2	4	3	2.26
	R-Fed	3	2	2	4	3	4	4	4	4	4	4	4	3	3	2	2	2	4	4	4	4	2	3	3.26
	R-ST	1	1	1	1	1	1	3	1	1	1	3	1	2	1	2	2	1	1	1	1	1	1	1	1.30
	R-3	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	2	2	3	2	2	3	3	1.96
S2C	N	3	3	3	3	4	2	1	3	3	4	1	3	2	1	2	2	3	3	3	3	3	2	3	2.61
	R-Fed	4	4	4	4	3	2	4	4	4	2	4	4	2	1	3	3	4	4	4	4	4	4	2	3.39
	R-ST	3	3	3	3	4	3	4	3	3	1	4	3	3	1	1	1	3	3	3	3	3	2	4	2.78
	R-3	1	1	1	1	1	1	1	2	2	1	1	2	1	3	3	3	1	2	2	2	2	1	3	1.65
	R-ISB	4	4	4	4	2	2	2	4	4	1	2	4	3	2	2	2	4	4	4	4	4	4	2	3.13
	C-Fed	2	2	2	2	3	3	3	1	1	1	3	1	2	3	4	4	2	1	1	1	1	3	1	2.04
	C-ST	3	3	3	3	3	3	1	3	3	3	1	3	2	2	3	3	3	3	3	3	3	2	4	2.74
	C-3	4	4	4	4	4	4	4	2	2	3	4	2	4	4	3	3	4	3	3	3	3	4	3	3.39

Table 71: Summary of Ranking of Socioeconomic Impacts By Response Type Within Scenarios *(continued)*																								
Scenario		**Socioeconomic Factor Impact Ranking (1 = worst) of Mean Impact**																						
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**Total**
OCC	**N**	1	1	1	1	1	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	**1.09**
	R-Fed	2	2	2	2	3	1	2	3	3	1	2	3	1	1	3	3	2	3	2	3	3	3	1	**2.22**
	R-ST	3	3	3	3	3	1	2	2	2	2	2	2	1	1	4	4	3	2	3	2	2	2	1	**2.30**
	R-3	4	4	4	4	2	1	1	4	4	4	1	4	1	1	2	2	4	4	2	4	4	4	1	**2.87**
	R-ISB	1	1	1	1	1	1	1	2	2	2	2	2	1	1	3	2	1	1	2	1	2	3	1	**1.52**
	C-Fed	3	2	2	3	1	1	3	3	3	3	2	3	1	1	2	1	2	3	3	3	3	1	1	**2.17**
	C-ST	2	2	2	2	1	1	3	1	1	1	2	1	1	1	1	3	2	2	1	2	1	2	1	**1.57**
	C-3	4	3	3	4	1	1	2	4	4	3	1	4	1	1	3	2	3	4	1	4	4	4	1	**2.70**
C1B	**N**	1	1	1	1	1	1	1	1	1	1	1	1	4	4	1	1	1	1	1	1	1	1	1	**1.26**
	R-Fed	2	2	2	2	2	1	3	1	1	1	3	1	1	1	1	1	2	1	1	2	2	3	2	**1.65**
	R-ST	4	3	3	4	4	1	2	1	1	1	2	1	2	2	1	1	4	1	1	4	4	2	2	**2.22**
	R-3	3	4	4	3	3	1	3	1	1	1	4	1	3	3	1	1	3	1	1	3	3	4	2	**2.35**
C2B	**N**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	**1.00**
	R-Fed	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	3	1	1	3	3	3	2	**1.74**
	R-ST	4	4	4	4	1	1	1	1	1	1	1	1	1	1	1	1	4	1	1	4	4	4	4	**2.17**
	R-3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	2	2	2	3	**1.43**

Rank order of socioeconomic impacts (1 = worst), comparing response types within scenarios for "no response" vs. federal, state, and 3rd alternative mechanical recovery (R), and between federal, state, and 3rd alternative response capability for dispersants – C and in situ burning (ISB). (ISB is included in ranking of mechanical recovery when there is no dispersant recovery for that scenario.) A = vessel delay ports; B = disrupted port business; C = port lost wages; D = marinas; E = shellfishing lost catch; F = shellfishing lost income due to closures; G = commercial fishing lost catch; H = commercial fishing lost income due to closures; I = fishing boat damage; J = Tribal area impact; K = Tribal fishing income loss; L = Subsistence fishing economic impact; M = state park lost use; N = state park lost income; O = national park lost use; P = national park lost income; Q = recreational boating lost use; R = sport fishing lost use; S = sport fishing lost spending; T = wildlife viewing spending loss; U = hunting lost spending; V = hunting lost value waterfowl; W = tourism spending loss.. Total = average rank

Table 72: Comparison of Average Socioeconomic Impact Rankings		
		Average Ranking of Socioeconomic Impact (1 = worst)
SI-Crud	N	1.09
	R-Fed	2.22
	R-ST	2.74
	R-3	3.39
	C-Fed	1.70
	C-ST	1.78
	C-3	1.78
IS-Crud	N	1.09
	R-Fed	2.30
	R-ST	2.78
	R-3	3.78
	C-Fed	1.00
	C-ST	2.04
	C-3	2.30
S1-Bunk	N	1.09
	R-Fed	2.48
	R-ST	2.13
	R-3	4.04
	R-ISB	3.52
S1-Dies	N	1.17
	R-Fed	2.70
	R-ST	2.26
	R-3	3.26
S2-Crud	N	1.30
	R-Fed	1.96
	R-ST	2.61
	R-3	3.39
	R-ISB	2.78
	C-Fed	1.65
	C-ST	3.13
	C-3	2.04
OC-Crud	N	1.09
	R-Fed	2.22
	R-ST	2.30
	R-3	2.87
	R-ISB	1.52
	C-Fed	2.17
	C-ST	1.57
	C-3	2.70
C1-Bunk	N	1.26
	R-Fed	1.65
	R-ST	2.22
	R-3	2.35
C2-Bunk	N	1.00
	R-Fed	1.74
	R-ST	2.17
	R-3	1.43

Conclusions [to be developed]

Oil spills in Washington State could involve significant impacts to commercial fishing, Tribal Nations, subsistence fishing, ports, tourism, wildlife viewing and hunting, and other resources important to the state and to neighboring British Columbia and Oregon. The measure of these values as shown in this report is always difficult and often involves a variety of assumptions. These analyzed impacts do not include other important impacts that oil spills might have, such as that impact longer-term quality of life, psychological impacts, and spiritual values, that have been described anecdotally for other oil spills, particularly the Exxon Valdez oil spill (Fall, *et al*. 2001; Russell, *et al*. 2001).

Overall, greater ability to remove oil offshore provides for less impacts of oil on the region's socioeconomic resources.

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